IMPACT OF HYPERTENSION EDUCATION INTERVENTION ON HEALTH COGNITION AND BEHAVIOUR IN SCHOOL CHILDREN

A thesis submitted during June, 2023 to the Centre for Health Psychology, School of Medical Sciences, University of Hyderabad in partial fulfilment of the requirements for the award of

DOCTOR OF PHILOSOPHY IN PSYCHOLOGY

by

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DECLARATION

I, Teisovinuo Semou, hereby declare that this thesis entitled "Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children" submitted by me under the guidance of Prof. Meena Hariharan is a bonafide research work which is also free from plagiarism. I also declare that it has not been submitted previously in part or in full to this University or any other University or Institution for the award of any degree or diploma. I hereby agree that my thesis can be deposited in Shodhganga/INFLIBNET.

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CERTIFICATE

This is to certify that the thesis entitled "Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children" submitted by Teisovinuo Semou bearing Reg. No. 18CPPH05 in partial fulfilment of the requirements for the award of Doctor of Philosophy in Psychology in the Centre for Health Psychology under School of Medical Sciences is a bonafide work carried out by her under my supervision and guidance.

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Further, the student has a publication before submission of thesis for adjudication and has produced evidence for the same in the form of the reprint in the relevant area of her research. The publication is mentioned below:

1. **Semou, T.**, & Monteiro, S. R. (2022). Hypertension Knowledge Intervention: A study on Awareness, Retention, and Effect on Healthy Lifestyle Practices among Children. *Indian Journal of Health Studies*, *4*(2), 107-121.

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3. International Conference of Indian Academy of Applied Psychology (IAAP) organized by Department of Psychology, Mizoram University (2022)
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2.	HP827	Book Review	4	Pass
3.	HP828	Review Paper	4	Pass
4.	HP829	Empirical Paper	4	Pass

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ACKNOWLEDGEMENTS

Fear of the Lord is the foundation of true knowledge, but fools despise wisdom and discipline.

- Proverbs 1:7

It is an immense pleasure to express my gratitude to all those who have contributed to the completion of this thesis.

First and foremost, I humbly express my deepest gratitude to the Almighty God, my Saviour, whose boundless grace and blessings have been the bedrock of my perseverance and determination throughout this journey. Without His divine guidance and strength, this achievement would have remained beyond my reach. It is through His love that I have found the courage to overcome obstacles and embrace this milestone.

I owe an immeasurable debt of gratitude to my beloved father, whose memory remains an indelible source of inspiration. His unwavering belief in my abilities and commitment to education continue to fuel my determination and resilience. My heartfelt gratitude to my mother, whose immeasurable role in my life and education cannot be overstated. Her love, sacrifices, and continuous prayers have fortified my spirit and provided solace and encouragement during moments of doubt and hardship. To my family, including my siblings, I express my deepest thanks for their support and encouragement throughout this journey.

I express my deep sense of gratitude to my esteemed Guide, Prof. Meena Hariharan, for her exceptional mentorship, insightful guidance, and constant dedication to my research work. Her expertise, profound insights, and invaluable feedback have not only shaped the trajectory of this research but also nurtured my own development as a scholar. I am immensely grateful for her belief in my abilities and her persistent commitment to fostering excellence.

I thank all the members of my Research Advisory Committee, Dr. Meera Padhy, Dr. G. Padmaja (Head, Centre for Health psychology), Dr. C.V Usha, and Prof. C. R. Rao. Their valuable suggestions, collective wisdom and constructive feedback have enriched the depth and quality of my research. I am also thankful to the Members of the Institutional Ethics Committee of the University of Hyderabad for their approval of my research proposal.

I would also like to acknowledge and extend my appreciation to all the teaching faculties from the Centre for Health Psychology. Their passion for education has been truly inspiring, and I am grateful for the impact they have had on my intellectual growth.

I am thankful to the Ministry of Tribal Affairs (MoTA) - National Fellowship and Scholarship for Higher Education for ST Students (NFST) for awarding me the prestigious fellowship that has allowed me to pursue my academic goals without financial constraints.

I am deeply indebted to all those who have helped me during the challenging data collection phase. I am truly grateful for the support of my mother, Mrs. Khrieleü Semou, who played a vital role in facilitating contact with several schools. Her dedication and guidance have been a true blessing throughout this journey. I also extend my heartfelt appreciation to my sisters, Meme and Vizo, as well as my brother, Dr. Ruokuo, for their invaluable assistance throughout this process. I am sincerely thankful to the Principal and Head of the schools, as well as all the teachers who generously allocated time to ensure the smooth execution of this study within their educational institutions. Their cooperation and support have been instrumental in the successful conduct of this research. I also thank all the participants of this study, whose contributions played a significant role in uncovering the answers to my research questions.

I would like to extend my gratitude to my colleagues, the research scholars from the Centre for Health Psychology, for their support and collaborative spirit. Our shared journey

has been filled with inspiring conversations, support for one another, and the development of a healthy scholarly community. Their diverse perspectives, valuable insights, and companionship have greatly shaped both my research and personal growth.

I would also like to express my sincere thanks to the non-teaching staff from the Centre for Health Psychology. Their assistance and support have greatly contributed in facilitating all my official work.

Lastly, but certainly not least, I am thankful to my amazing friends who have directly or indirectly contributed to the completion of my thesis. Their constant support, words of encouragement, and presence during challenging times were priceless.

TEISOVINUO SEMOU

ABSTRACT

The increasing prevalence of hypertension and the subsequent rise in cardiac emergencies underscore the pressing need for effective management of hypertension. As hypertension rates continue to escalate globally, including within India where the onset age is showing a progressive declining trend, it is imperative to consider innovative public health measures to curb this escalating trend. Focusing on school children as a target group serves two crucial purposes: firstly, preventing the incidence of hypertension among children and adolescents, and secondly, establishing a long-term plan to safeguard this age group as they transition into high-risk adults in the future. A cost-effective preventive strategy involves imparting knowledge about the disease through cognitive interventions, thereby serving as an innovative public health measure. Optimal adherence to medically prescribed regimens and lifestyle modifications, encompassing dietary adjustments and exercise, are integral to effectively managing hypertension. Furthermore, identifying the psychosocial factors associated with knowledge retention can aid in designing integrated intervention measures as foolproof preventive actions for the future. In light of these considerations, this research implemented a hypertension education intervention to school children, aiming to enhance their knowledge about hypertension and empower them to take proactive measures for its prevention and control. A total of 403 school going children from 6^{th} to 10^{th} class were recruited through purposive sampling. The school children were assessed prior to the intervention module for their hypertension knowledge using the Hypertension Knowledge Test (HKT), healthy lifestyle practices using the Healthy Lifestyle Practice Scale for Children and Adolescents (HELIPSCA), personality traits using the Big Five Questionnaire for Children (BFQ – C), and achievement motivation using the Achievement Motivation Inventory (AMI). The total marks' percentage of their immediately preceding examination were also recorded from the school record. They were then enrolled into the hypertension

education intervention that was conducted twice (first, 1 day after their pre-test assessments, the second after a gap of 1 week from the first exposure). The children were reassessed for their hypertension knowledge five times – once immediately after the first exposure to the intervention, and thereafter at a gap of 14 days, 35 days, 63 days and 91 days after the first exposure to the intervention. Healthy lifestyle practices were also reassessed at a gap of 91 days after the first exposure to the intervention. Repeated Measures ANOVA results showed that hypertension education intervention was effective in improving the overall knowledge as well as the knowledge levels in particular domains related to hypertension across the time span ranging from immediate to 91 days after the first exposure to the intervention; suggesting an increase in the level of retention of knowledge. Paired t - test results indicated a significant positive change in the healthy lifestyle practices in school children following the hypertension education intervention. Two – way ANOVA analysis to examine the differential impact of the hypertension education intervention between the two age groups – early adolescents and late adolescents revealed that early adolescent age group showed a significantly higher healthy lifestyle changes following hypertension education intervention. Further, to identify the psychosocial factors contributing to knowledge enhancement and improved healthy lifestyle practices following hypertension education intervention, Pearson Product - Moment Correlation and Stepwise Multiple Regression analyses were conducted. Results revealed that agreeableness dimension of the Big five personality traits, examination mark, academic class, and gender positively contributed to enhancing the hypertension knowledge levels in school children. When it came to healthy lifestyle practices, agreeableness dimension of the Big five personality traits, achievement motivation, and improvement in hypertension knowledge in the dimension - causes, care, casualty and awareness positively contributed to the healthy lifestyle changes; while neuroticism dimension of the Big five personality traits, age, and previous knowledge about hypertension

have negatively contributed. The hypertension education intervention implemented in this study demonstrated its effectiveness in establishing a robust knowledge foundation among the school children, leading to positive improvements in their healthy lifestyle practices. This innovative approach to hypertension management presents a promising and sustainable solution for effective hypertension control. Implications, strengths, and limitations of the study are also discussed.

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ACE	Angiotensin-Converting Enzyme
AMI	Achievement Motivation Inventory
ANOVA	Analysis of Variance
ARBs	Angiotensin Receptor Blockers
BFQ-C	Big Five Questionnaire for Children
BMI	Body Mass Index
BP	Blood Pressure
CIMT	Carotid Intima Media-Thickness
COVID-19	Corona Virus Disease of 2019
DALYs	Disability-Adjusted Life-Years
DASH	Dietary Approaches to Stop Hypertension
GPA	Grade Point Average
HBM	Health Belief Model
HELIPSCA	Healthy Lifestyle Practice Scale for Children and Adolescents
HKT	Hypertension Knowledge Test
HTN	Hypertension
IBM	International Business Machines Corporation
ICMR	Indian Council of Medical Research

ID	Identification
IMB	Information Motivation-Behavioural Skills
LCD	Liquid Crystal Display
mmHg	millimetre (s) of Mercury
NCDs	Non-Communicable Diseases
NHBPEP	National High Blood Pressure Education Program
pH	potential of Hydrogen
PMT	Protection Motivation Theory
SDGs	Sustainable Development Goals
SDT	Self-Determination Theory
SPSS	Statistical Package for Social Sciences
VIF	Variation Inflation Factor
WHO	World Health Organization

Chapter I

INTRODUCTION

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Background

Hypertension, also known as high blood pressure, is a common medical condition characterized by consistently elevated blood pressure. Blood pressure is the force exerted by blood on the walls of the arteries as the heart pumps it throughout the body. Blood pressure is measured by two values: the systolic pressure, which is the top number indicating the pressure when the heart pumps blood out, and the diastolic pressure, which is the bottom number indicating the pressure when the heart is at rest between pumping. A normal blood pressure reading is 120/80 mmHg or lower, while a reading of 130/80 mmHg or higher indicates hypertension. There are two types of hypertension: primary hypertension, which has no clear underlying cause, and secondary hypertension, which is caused by an underlying medical condition.

Essential hypertension, also known as primary hypertension, is the most common type of hypertension and is often characterized by chronic elevation of blood pressure with no identifiable underlying cause. It is estimated that up to 95% of all cases of hypertension fall under this category. Although the exact mechanisms of essential hypertension are not completely known, it is thought to be caused by a combination of genetic, environmental, and lifestyle factors. Various factors such as age, race, family history, physical inactivity, obesity, high salt intake, and excessive alcohol consumption have been associated with the development of essential hypertension. Essential hypertension is often a chronic condition that requires long-term management. The goal of treatment is to reduce blood pressure to within normal range, and prevent the development of complications associated with hypertension. Lifestyle changes like maintaining a healthy weight, consuming a low-sodium

diet, engaging in regular physical activity, and limiting alcohol intake can help manage essential hypertension effectively. Additionally, pharmaceutical treatments, including diuretics, beta-blockers, calcium channel blockers, and angiotensin converting enzyme (ACE) inhibitors, may be recommended to reduce blood pressure levels. The specific medication prescribed will depend on the severity of hypertension, any other concurrent health issues, and individual patient characteristics.

Secondary hypertension, in contrast, arises from an existing medical condition such as kidney disease and endocrine disorders. Secondary hypertension is often characterized by sudden onset and more severe symptoms. The treatment of secondary hypertension involves addressing the underlying cause.

Hypertension is commonly known as a "silent killer" due to the absence of symptoms until it causes significant damage to vital organs such as the heart, brain, and kidneys. This damage can result in serious and potentially life-threatening complications such as myocardial infarction, stroke, renal failure, and vision impairment. Therefore, it is crucial to undergo regular blood pressure monitoring and adopt healthy lifestyle habits such as regular exercise, a balanced diet, and limited alcohol and salt intake, in order to prevent and manage hypertension.

Impact of Hypertension on Physical Health

An individual's health and quality of life can be significantly impacted by hypertension. The higher the blood pressure, the greater is the risk of developing complications. If left untreated, hypertension can have significant impacts on an individual's health and quality of life. One of the most serious complications of hypertension is cardiovascular disease, which can lead to heart attacks, strokes, heart failure, and peripheral artery disease (Kannel, 1995). The walls of the arteries may get damaged as a result of

hypertension, leading to the formation of plaque and narrowing of the arteries. This can increase the risk of developing blood clots, which can result in heart attack or stroke. Another potential impact of hypertension is chronic kidney disease and renal disease (He & Whelton, 1997; Reynolds et al., 2007). Hypertension can damage the small blood arteries in the kidneys, impairing kidney function or potentially causing kidney failure. This can result in a build-up of waste products and fluid in the body, which can cause symptoms such as fatigue, swelling, and difficulty concentrating. Hypertension can also have a negative impact on vision (Fraser-Bell et al., 2017). It can damage the blood vessels in the eyes, impairing vision or possibly causing blindness. Hypertension has also been associated with the decline in the cognitive functions in the elderly and a higher risk of developing dementia (Naing & Teo, 2020). Hypertension can also have emotional and psychological impacts, such as anxiety and depression (Shah et al., 2022). In addition to these health impacts, hypertension can also have a considerable impact on a person's day-to-day life. It can induce symptoms such as headaches, dizziness, and shortness of breath (World Health Organization [WHO], 2023) which can impair one's ability to perform daily activities.

Hypertension Prevalence

The World Health Organization (WHO) has stated that hypertension is a major global public health concern, with approximately 1.28 billion adults aged 30-79 years being affected by the condition worldwide. Nearly half of these individuals are unaware that they have hypertension, and two-thirds live in low and middle income countries, where resources for prevention and management of the condition may be limited (WHO, 2023). The global increase in the prevalence of hypertension from 17.3% in 1990 to 20.5% in 2015 represents a significant jump, equivalent to an increase of 3.2% (Forouzanfar et al., 2017). The rise in the prevalence of hypertension is a concerning trend in global health.

Several studies have examined the prevalence of hypertension across different parts of the world. One such study analyzed data with 19.1 million participants. According to the study, in 2015, the global average age-standardized systolic blood pressure (BP) for men was 127.0 mmHg, while women had a slightly lower mean of 122.3 mmHg. In terms of age-standardized diastolic BP, men displayed a mean of 78.7 mmHg, whereas women showed a slightly lower mean of 76.7 mmHg. The study showed that individuals from sub-Saharan Africa, Central and Eastern Europe, and South Asia had higher mean systolic and diastolic BPs than those in high-income Western and high-income Asia-Pacific regions. Over the period between 1975 and 2015, the estimated global mean age-standardized systolic BP in men remained stable at 126.6 mmHg in 1975 and 127.0 mmHg in 2015. However, in women, the estimated global mean age-standardized systolic BP slightly decreased from 123.9 mmHg in 1975 to 122.3 mmHg in 2015. Similar trends were observed for estimated global mean age-standardized diastolic BP, with men experiencing minor changes and women showing a slight decrease. The changes in estimated mean BP varied significantly by region during the period between 1975 and 2015, with high-income countries experiencing a significant decrease in BP, while low- and middle-income regions witnessed an increase in BP (Zhou et al., 2017). The study also found that both men and women in South Asia, sub-Saharan Africa East and Southeast Asia, and Oceania experienced an increase in systolic and diastolic BP.

Chow et al. (2013) investigated the association between residents of rural and urban areas and hypertension prevalence in different parts of the world. The outcome of the study was dependent on the economic standing of each country. In countries with high-income and middle-income levels, hypertension was found to be more prevalent among individuals living in rural areas than those residing in urban areas. Conversely, in low-income countries, individuals living in urban areas were found to have a higher prevalence of hypertension than those residing in rural areas. There is variation in the prevalence of hypertension across

different regions, and differences in the levels of risk factors associated with the condition could account for some of this variation. These risk factors are high consumption of sodium, insufficient intake of potassium, obesity, alcohol consumption, insufficient physical activity, and an unhealthy diet (Mills et al., 2020). The higher the prevalence of these risk factors in a given region, the more likely it is for hypertension to be prevalent in that area. It is important to note that these risk factors are often interrelated and can exacerbate one another. For example, physical inactivity can lead to weight gain and obesity, which are both risk factors for hypertension. Similarly, consumption of high in sodium and low potassium can contribute to both hypertension and obesity. Therefore, efforts to reduce the prevalence of hypertension should address these multiple risk factors simultaneously.

Hypertension Prevalence in India

India is home to a large population and has a significant burden of hypertension with an estimated 220 million people affected by the condition. Hypertension is a prevalent public health issue in India, affecting a significant proportion of the population. In 2014, Anchala et al. carried out a systematic review and meta-analysis that revealed a high prevalence of hypertension (29.8%) in the Indian population aged 18 years and older. The study also indicated disparities in hypertension rates between urban (33.8%) and rural (27.6%) areas, with higher prevalence observed in the urban areas. Despite the high prevalence of hypertension in both rural and urban areas, the study found that awareness, treatment, and control of blood pressure were lower in rural areas than in urban areas. Specifically, only 25% of rural Indians, who had hypertension, were aware of their condition, and a similar percentage were undergoing treatment for it. These figures were higher for urban Indians, with 42% being aware of their condition and 37.6% receiving treatment. The control of hypertension in India is alarmingly low, with only a small fraction of individuals in rural areas (one-tenth) and urban areas (one-fifth) successfully managing their blood pressure. This

indicates the urgent need to intensify efforts aimed at enhancing hypertension awareness, treatment, and management across both rural and urban regions; enhancing awareness, diagnosis, and treatment of hypertension in rural areas is crucial in reducing the burden and its associated health issues in India. A study also reported a higher prevalence in hypertension among men, with 27.4% of men having hypertension compared to 20% women (Geldsetzer et al., 2018).

Hypertension Prevalence in Children and Adolescents

Hypertension among children and adolescents is also becoming a growing concern. In a study by Song et al. (2019), the pooled estimate indicated that the global prevalence of childhood hypertension is at 4%, with an increasing trend observed from 1994 to 2018. The study also reported varying prevalence rates of high blood pressure among different age groups, ranging from 4.32% for six-year-olds to 3.28% for nineteen-year-olds. The highest prevalence was observed among fourteen-year-olds with a rate of 7.89% in the year 2015. This suggests that hypertension is becoming more prevalent at younger ages. The study also found that overweight and obesity were strongly associated with hypertension in this age group, highlighting the need for lifestyle interventions focussing on physical activity and healthy diet to address this issue. Additionally, the study reported that the pooled prevalence of pre-hypertension was 9.7%, indicating that many children and adolescents are at risk of developing hypertension if preventative measures are not taken. Another study by Meena et al. (2021) highlights the concerning prevalence rates of hypertension among children aged 4 to 19 years in India. The study found a pooled prevalence of 7% for hypertension, 4% for sustained hypertension, and 10% for pre-hypertension. The prevalence of hypertension has been increasing since 2005, with urban children showing a higher prevalence compared to their rural counterparts. The study also highlights the strong association between obesity and hypertension, there was a substantial increase in the incidence of hypertension among obese

children, with a prevalence rate of 29% compared to 7% for those with normal weight. Furthermore, the prevalence rate of pre-hypertension was slightly higher than the global prevalence rate at 10%, indicating a worrying trend of hypertension and pre-hypertension in Indian children. Another study conducted among a sample of 11,312 Indian children aged between 5-15 years by Patel et al. (2019) revealed that the prevalence of pre-hypertension and hypertension was a growing concern among children in India. The study revealed that 6.9% of boys and 6.5% of girls had pre-hypertension, while 6.8% of boys and 7.0% of girls had hypertension.

The rising prevalence of hypertension among children is a worrying trend that poses a risk of long-term consequences as they grow into adulthood. Elevated blood pressure during childhood is linked to vascular changes that can impact vital organs such as the eyes, kidneys, brain, and heart. Moreover, studies suggest that hypertension during childhood can have adverse effects on neuro-cognitive function, particularly in areas such as attention, memory, and executive functioning. In addition, the presence of micro-albuminuria, an early sign of kidney disease, indicates damage to the glomeruli and endothelial dysfunction, increasing the risk of kidney damage, and may lead to cardiovascular events in the future (Vasilevska-Ristovska et al., 2018). The increasing number of adolescents globally, particularly in low- and middle-income countries, highlights the importance of monitoring and addressing the rising prevalence of hypertension in this population. The World Health Organization (WHO) estimates that there are 1.2 billion adolescents worldwide, representing approximately one-sixth of the global population, and this number is expected to rise further through 2050 (WHO, 2019; n.d.). The rising prevalence of hypertension among children is a worrisome trend that can have long-term consequences. Early detection and management of hypertension in children are crucial in preventing end-organ damage, impaired neuro-cognitive function, and the development of kidney disease. Parents, caregivers, and

healthcare providers should work together to ensure that children with hypertension receive appropriate care and management to reduce their risk of complications. It is also crucial to address hypertension through preventative measures, such as promoting health education, healthy lifestyles, and regular blood pressure monitoring.

Impact of Hypertension and Future Projection

Over the last 40 years, the number of individuals affected by Hypertension (HTN) or elevated Blood Pressure (BP) has doubled, according to the World Health Organization (WHO). Between 1975 and 2015, the global number of individuals affected by hypertension rose significantly from 594 million to 1.13 billion, with a significant proportion of those affected residing in low- and middle-income nations (WHO, 2023). With a persistent rise in the prevalence of hypertension, increase in elderly population, and longer life expectancy, the low - and middle - income countries is expected to experience a substantial disease burden. In 2017, Global Burden of Disease' (GBD) findings revealed that high systolic blood pressure was the foremost global risk factor, contributing to 10.2 million fatalities and 208 million disability-adjusted life years (DALYs). High systolic blood pressure (SBP) contributed to 8.61% of total DALYs. Stroke and ischemic heart disease were the primary contributors to the burden caused by high systolic blood pressure and accounted for 56.5% and 55.5% of the disability-adjusted life years (DALYs) respectively (GBD 2016 Risk Factors Collaborators, 2017). This highlights the need for effective prevention and management strategies for high blood pressure to reduce the incidence of these serious and often fatal diseases and also the need for increased efforts to prevent and manage high blood pressure, particularly in low - and middle - income countries where it is more prevalent compared to other regions.

Throughout four decades, from 1969 to 2011, the prevalence of hypertension in India varied depending on the regions, with a prevalence range of 13.9% to 46.3% in urban areas

and 4.5% to 58.8% in rural areas (Devi et al., 2013). As the population of the country grew at a fast pace, the number of individuals affected by uncontrolled blood pressure also continue to increase. Gupta et al. (2019) reviewed data from the study of the Global Burden of Diseases and found that hypertension was responsible for 1.63 million fatalities in 2016, which was a significant increase compared to 0.78 million deaths in 1990, representing a 108% increase. The disease burden caused by hypertension, as indicated by disability-adjusted life years (DALYs), also increased from 21 million in 1990 to 39 million in 2016, which represents an 89% increase. Although an exact count of hypertension patients in India is not available, the increasing trends in DALYs and other parameters provide strong evidence that hypertension is on the rise in the country. It has become one of the most significant causes of fatalities and disabilities (Gupta & Xavier, 2018), emphasizing the need for effective measures to control and prevent hypertension in the population. There is need for increased attention and resources to address the growing burden of hypertension in India. Failure to address this issue may lead to continued increases in mortality and morbidity rates, with significant implications for individuals, families, and society as a whole. The velocity at which hypertension rate is increasing will have a substantial impact on the country's socioeconomic burden. It is estimated that direct costs associated with hypertension, which include the expenses incurred for treatment of the disease and its clinical manifestations, account for 10% of total health expenditure globally. However, when indirect expenditures, such as costs due to lost productivity, are taken into account, the absolute cost figures increase by 10-fold. Global estimates suggest that the expenditure related to high blood pressure is likely to reach 1 trillion dollars in the near future. Suboptimal blood pressure is a growing economic and health burden in developing countries. Although high-income countries currently bear the majority of the expenditure, a rising proportion of the costs will be borne by developing countries (Gaziano et al., 2009). Nevertheless, hypertension is also a

significant, preventable risk factor for cardiovascular disease as well as premature death (Mills et al., 2020), which highlights the significance of both therapeutic and preventive measures in tackling the growing threat of hypertension to the overall health status of the population. To combat the increasing prevalence and burden of hypertension, it is necessary to raise awareness among the community, as well as among governmental and non-governmental sectors, and establish programs aimed at curbing this problem. Without interventions, hypertension is projected to become more prevalent and burdensome, especially in low- and middle-income nations (Forouzanfar et al., 2017; Mills et al., 2016; Zhou et al., 2017).

Projections on hypertension prevalence rate, awareness, treatment, and control until 2030 using data from all Jaipur Heart Watch (JHW) studies with logarithmic forecasting showed that the prevalence of hypertension would increase by 17% and reach 44% in year 2030 (Gupta et al., 2018), contrary to the World Health Organization's (WHO) prediction of a 25% decrease in hypertension prevalence by the same year. These projections emphasize the need for urgent action to address the growing burden of hypertension in the population. The projections of hypertension for the future should not be taken lightly, and action needs to be taken to prevent them. It is important to note that the people who will go into adulthood during those years are the children now. This means that the children of today will be the adults of tomorrow who will be affected by the projected increase in hypertension prevalence. The current generation of young people will experience a distinct adolescence journey from previous generations, and they will confront new obstacles concerning their health and overall welfare. How they navigate these crucial years will significantly impact their future health and the economic and social progress of the country. The challenges faced by young people today are unique, given the ever-changing technological, social, and economic landscape. Therefore, it is crucial to sensitize these adolescents now with the knowledge

about hypertension and making healthy lifestyle choices that can help prevent hypertension in the future. Additionally, teaching these age groups on the role of lifestyle such as healthy eating habits, regular physical activity, and stress management can lay the foundation for a lifelong practice as these individuals transition into adulthood, and contribute to reducing the risk of hypertension.

Adolescents have the potential to bring about positive change in their communities (Lakin & Mahoney, 2006; Makhoul et al., 2012). However, there are concerns about the level of exposure of young people to health risk behaviours that can have long-term consequences. Certain health-related behaviours that often begin during adolescence, such as drug or alcohol use, poor diets, and smoking, are contributing factors to the epidemic of non-communicable diseases in adults (Akseer et al., 2020). Adolescence is a period of intense growth and development, both physically and mentally. During this period, young people experience significant changes in their brain development, cognitive abilities, and social-emotional skills. According to Jean Piaget's theory of cognitive development (Inhelder et al., 1976), the development of cognition undergoes four distinct stages, namely, the sensorimotor stage, the preoperational stage, the concrete operational stage, and the formal operational stage. During adolescence, individuals are typically around the age of 10 or more. At this age, they are moving from concrete operational stage to formal operational stage. In the formal operational stage (i.e., starting from around age 12 through adulthood), individuals are able to engage in abstract thinking, hypothetical reasoning, and systematic problem-solving. They are also capable of thinking about the future and considering multiple possibilities and outcomes. Thus, health education during this stage of adolescence will have profound impact and can have lifelong effects.

Adolescence period is also often marked by risk-taking behaviour. Risk-taking behaviour involves taking actions that may have beneficial outcomes but can also result in

unfavorable or adverse consequences (Boyer, 2006; Ernst et al., 2006). The incidence of risk-taking behaviour increases during adolescence (Gardner & Steinberg, 2012), which is linked to heightened emotional reactivity and an underdeveloped ability to regulate oneself (Steinberg, 2008; 2010). Due to their still-developing self-regulation skills, adolescents are more susceptible to the adverse consequences of engaging in risky behaviour (Steinberg, 2005). Therefore, it is crucial to recognize the increased susceptibility of adolescents to the adverse consequences of risk-taking behaviours and to take steps to promote healthy behaviours and decision-making during this period. By equipping health knowledge and skills related to healthy behaviour during adolescence period, they will be better able to make informed decisions that positively impact their well-being both in the short and long term. They can develop the knowledge and skills necessary to regulate their health behaviour and achieve positive health outcomes throughout their lives. Imparting knowledge intervention during adolescence can help establish a strong cognitive foundation, which can positively influence cognition, emotion, motivation, and behaviour. When an individual possesses a strong cognitive foundation related to a health factor, they are more likely to experience fear or concern when considering engaging in risky behaviour that could negatively impact their well-being. This emotional response can act as a powerful motivator, encouraging individuals to take action to avoid negative outcomes and make healthier choices. For example, if an adolescent possesses a strong understanding of the risks associated with smoking, they may experience fear or concern when considering taking up smoking. This emotional response can motivate them to make healthier choices, such as avoiding smoking altogether, which can positively impact their well-being in the long term. Therefore, by providing knowledge intervention during adolescence and fostering a strong cognitive foundation, individuals are better equipped to understand the risks associated with unhealthy behaviour, experience appropriate emotional responses, and develop strong motivations to engage in healthy

behaviour. This logical link between cognition, emotion, motivation, and behaviour is supported by the Health Belief Model (HBM). The Health Belief Model (Rosenstock, 1974) suggests that an individual's perception of the severity and susceptibility of a particular health issue, as well as the perceived benefits and barriers of engaging in healthy behaviour, influence their motivation to take action to prevent or manage the issue. The cognitive component of the HBM involves an individual's perception of the threat posed by a health issue. This includes their perception of the severity of the issue, such as the potential consequences of developing a particular illness or disease, and their perception of their susceptibility to the issue, such as their perceived likelihood of developing the illness or disease. The Protection Motivation Theory (PMT) (Rogers, 1975) includes the efficacy response and motivation components. This cognitive component is linked to the emotional component which involves an individual's emotional response to the perceived threat. This emotional response can include fear, anxiety, or worry, which can act as a motivator to take action to protect oneself from the health risk behaviour. Thus, the protection motivation influences the health behaviour as per the PMT.

Factors Influencing Receptivity to Knowledge Intervention

While cognitive interventions can be helpful in building a strong cognitive foundation among adolescents, it is important to recognize that individual differences can impact how receptive they are to these interventions, and how well they are able to apply the knowledge gained to their lives. There are many factors that can impact an adolescent’s receptivity to cognitive or knowledge interventions, and their ability to translate that knowledge into healthy lifestyle practices. Some of these factors include academic performance, personality traits, and achievement motivation.

Academic Performance

Academic performance is one factor that can impact an adolescent's receptivity to cognitive or knowledge interventions. Adolescents who perform well academically may be more likely to take these interventions seriously, as they may view them as an opportunity to improve their academic performance even further. They are more likely to be actively involved in their learning tasks and activities (Lei et al., 2018). On the other hand, adolescents who struggle academically may be less receptive to these interventions, as they may view them as additional academic pressure or as something that is not relevant to their academic performance. In the present study academic performance is operationally defined as the performance reflected in the overall examination marks.

Personality Factors

Personality factors can also play a role in how receptive adolescents are to health interventions. For example, in a healthy lifestyle interventional study among adolescents by Yañez et al. (2020), certain personality traits were associated with adherence to healthy lifestyle behaviours among adolescents. Higher levels of conscientiousness were associated with a lower risk for non-adherence to healthy behaviours including following a Mediterranean diet, abstaining from tobacco and alcohol, and minimizing excessive use of screens and social network sites. This is consistent with the idea that conscientious individuals are more likely to be self-disciplined and goal-oriented, and therefore more likely to adhere to healthy behaviours. This study also revealed that higher levels of extroversion were associated with a reduced likelihood of being physically inactive, potentially attributable to the tendency of extroverted individuals to actively seek social activities that involve physical activity; and higher levels of neuroticism were associated with tobacco consumption and sleep problems, which may be because neurotic individuals are more likely

to experience anxiety and stress, which can lead to unhealthy coping behaviours. Similarly, adolescents who are more open-minded and curious may be more receptive to new ideas and concepts presented in cognitive interventions, while those who are more closed-minded or resistant to change may be less receptive. And adolescents who are more conscientious and self-disciplined may be more likely to apply the knowledge gained from cognitive interventions to their lives, while those who are less conscientious may struggle to do so. Achievement motivation, or the desire to achieve success and excellence, is another personality factor that can impact how receptive adolescents are to cognitive interventions. Adolescents with high levels of achievement motivation will have a strong sense of grit in them. In a systematic review by Christopoulou et al. (2018), high levels of grit were associated with better academic performance, as measured by Grade Point Average (GPA) scores, science and language scores, and academic conscientiousness. Adolescents with higher levels of grit tended to be more motivated, attend school more regularly, and display better behaviour in the classroom. Thus, these adolescents will be more likely to persevere through difficult tasks and to maintain their focus and effort over time and will be more receptive to cognitive interventions. They may view the intervention as a way to improve their skills and abilities, and may be more likely to apply the knowledge gained to their lives in order to attain their goals. Adolescents with low levels of achievement motivation, on the other hand, could be less receptive to cognitive interventions, as they may not see the relevance of these interventions to their goals or aspirations.

For the purpose of this study, personality factors refer to the Big Five factors (viz., extraversion, agreeableness, conscientiousness, neuroticism, intellect/openness) and achievement motivation.

To summarise, it may be stated that given the alarming progression in the prevalence of hypertension across the globe as well as in India, where the onset age is also showing a progressive declining trend, it is time to give a serious thought about innovative public health measures to arrest the growing trend of the disease. Two reasons to concentrate on the adolescents as the target group includes a measure to prevent incidence among the children and adolescence and secondly to have a long term plan to protect this age group which will reach the high risk group of adults as per the future projections. The most cost-effective preventive step is to create a cognitive base about the disease through knowledge intervention. This would be an innovative public health measure. It is also important to identify the psychosocial factors associated with sustenance of knowledge so that the insight gained thus helps in planning integrated intervention measures in futures as a fool-proof preventive action.

Chapter II

REVIEW OF LITERATURE

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Background: Nature, Prevalence, and Incidence of Hypertension

Hypertension is a leading and pertinent causal risk factor for innumerable cardiac hazards like cardiac hypertrophy, arrhythmias, and multiple organ failures (Kjeldsen, 2018). The number of cardiovascular cases caused by hypertension has almost doubled since 1990 rising to 523 million as reported in 2019, impending premature mortality (Roth, 2020). It also causes debilitated daily functioning with an active increase of 16.7 million in years of lives lost. Although it is a public health challenge affecting population globally, the low middle income countries are incumbently suffering due to low awareness and management of this disease (Mills et al., 2020). In a resource poor setting yet population dense country like India, the figures suggest that more than half the deaths are cardiac failures, where hypertension is a direct contributor (Gupta, 2004) and remains the most pertinent factor for death and disability (Indian Council of Medical Research [ICMR], 2017). By 2025, it is projected that almost 22.9% of Indian men and 23.6% of Indian women will be diagnosed with this condition (Kearney et al., 2005). Another ignored fact is of hypertension occurrence during childhood which is also predictive of essential hypertension in adulthood and cardiovascular ailments. Measurement of hypertension in children itself can be a complicated process as the readings of blood pressure gradually decrease with subsequent doctor visits (Sun et al., 2017). Paediatric hypertension can be a misleading diagnosis and hence its confirmation is contingent upon detection of high blood pressure on at least 3 individual occasions adjusting for age, sex, and body size to avoid false positives (National High Blood Pressure Education Program [NHBPEP], 2004). Alarmingly, there is an upward trend in the global estimate of the prevalence of childhood hypertension starting from 3.2% in the paediatric population

(McNiece et al., 2007). According to a meta-analytic study by Song et al. (2019), there has been a rise in the percentage of children aged 6-11 years with high blood pressure, from 3.0% to 5.3%. Similarly, the proportion of adolescents aged 12-16 years with high blood pressure has increased from 3.8% to 6.8%. It is a case of caution as elevated blood pressure in children also shows signs of premature ageing and other complications such as metabolic syndrome, pH development, and poor cardiac output in adulthood (Litwin & Feber, 2020).

Hypertension, despite being a manageable risk factor has been a relentless challenge to health practitioners either because of the lack of treatment post diagnosis, or the lack of diagnosis itself because of little to minimal awareness. Hypertension awareness studies in India have reported that a mere 42% of Indians residing in urban areas and only 25% of those in rural areas were aware that they had high blood pressure (Anchala et al., 2014). Similar findings have been reported by national surveys (Jose et al., 2019), where it was discovered that a significant majority of the participants, over 80%, had blood pressure that remained uncontrolled even after receiving prescriptions for antihypertensive medication, and that only 44% of hypertensives were aware of their condition prior to undergoing screening. The marked increase and ignorance of hypertension status among children is also seen to be dependent upon modifiable risk factors of hypertension such as shifts in urban lifestyle and increases in abdominal obesity, poor diet, higher salt intake, and sedentary lifestyle (Amritanshu et al., 2015; Meena et al., 2021). It calls for an urgent requirement to actively plan a scalable management plan that would substantially predict a hypertensive crisis and bring down prevalence rates to meet the health related Sustainable Development Goals (SDGs) (Gupta et al., 2018). Hypertension is intimidating health resilience in children and adolescents, urging health stakeholders to develop a more proactive approach that would inculcate a preventive regimen through awareness programs and ensuring immediate action on diagnosis.

Hypertension Control Strategies (Biomedical and Biopsychosocial)

Until the 20th century, numerous scientists, doctors, and surgeons had adopted only the biomedical approach. Although the trend is changing, doctors continue to choose the biomedical model to explain the pathophysiology of diseases irrespective of whether it is acute or chronic (Weston, 2005). Management of chronic illness is broadly conservative and leans towards medical management. However, the use of alternative or non-pharmacological treatment plans is required in contemporary illness management (Jaini & Lee, 2015). The primary approach to hypertension management is pharmacological treatment. There are several medicines that are used to control high blood pressure like the Angiotensin-converting enzyme (ACE) inhibitors that relaxes blood vessels, Angiotensin-2 receptors blockers (ARBs) which is recommended if ACE inhibitors have unfavourable side effects, Calcium channel blockers that work by widening blood vessels, Diuretics that help to flush out excess water and salt through urine, and Beta blockers which reduce the pressure on the heart. The prolonged and isolated use of these medications may lead to certain undesirable side effects further emphasizing on the necessity to include non-pharmacological treatment plans to incorporate the biopsychosocial approach.

George Engel first proposed the biopsychosocial model in 1977. This model posits that biological factors alone do not determine the medical status of an individual. A holistic comprehension must be built by admitting the psychological and social variables of the person’s health status (Engel, 1977). This is recommended given the long-term effect of chronic illnesses especially. Also known as "alternative medicine or alternative therapy," non-pharmacological treatment options are more readily adopted than pharmacological therapy because they don't have any negative side effects and can be used as an effective adjuvant to control blood pressure. Most non-pharmacological treatments for hypertension focus on changing one's lifestyle. Recent studies have documented the beneficial impact of

lifestyle changes on the control of hypertension. These lifestyle changes include dietary adjustments, limiting sodium intake, increasing potassium intake, managing weight, engaging in daily physical activity, consuming less alcohol, and manageable stress levels. In addition to increasing intake of monounsaturated and polyunsaturated fatty acids, fruits, vegetables, and grains, the dietary changes also call for reducing consumption of high sodium content foods and alcohol. Adopting either the DASH (Dietary Approaches to Stop Hypertension) diet or the well-known Mediterranean diet can meet the nutritional needs of hypertensive individuals. Both diets have a track record of managing hypertension effectively (Filippou et al., 2020; Filippou et al., 2021). Another issue that needs to be addressed is high sodium intake. Numerous studies have shown that reducing sodium intake had significant effects on lowering blood pressure (Grillo et al., 2019; He et al., 2013; He et al., 2020; Kumanyika et al., 1993). According to a study, processed foods account for 77% of all sodium intake, while cooking and table salt account for 11.3% (Mattes & Donnelly, 1991). Similarly, hypertension management also requires an increase in dietary potassium and phosphorus intake. These beneficial ions are present in higher amounts in the DASH and traditional Mediterranean diets. To prevent complications caused by hypertension, this diet could be started earlier in life. Another effective technique for managing hypertension is weight loss and exercise. A 30-minute walk exercise thrice weekly can help lower blood pressure (Rezky et al., 2019). The management of stress and alcohol use is also essential for the control of hypertension (Gupta & Guptha, 2010; Katsarou et al., 2014; Roerecke et al., 2017).

Though lifestyle management proves to be very effective in controlling BP, accepting lifestyle changes in the long term is difficult for most people. In a study by Kebede et al. (2022) among hypertensives, it was found that the practice towards healthy lifestyle modification was significantly inadequate. Out of 387 participants, only 38.8% followed healthy practices related to preventive measures and lifestyle modifications for hypertension

management. Only a small percentage of the hypertensive patients (four in ten) adhered to the recommended lifestyle practices aimed at controlling hypertension and its associated risks. Among the various components of lifestyle modification, physical exercise and managing stress were found to be poorly practised. Although controlling one's lifestyle assures that the disease can be managed effectively, the long-term challenge is posed by the distinctive need to "change." The patient's behaviour or "habits" must alter because of the change that is required, which includes dietary changes, a commitment to regular physical activity, and stress management strategies. Even today, the traditional medical model still dominates how doctors diagnose and treat hypertension, identify the underlying causes of the condition, prescribe an appropriate course of action, and only monitor patients during follow-up appointments (Logan, 2013). The goal here isn't to get rid of medical intervention altogether but to develop a beneficial approach to better health that has minimal drawbacks and numerous advantages. Based on the data available, 75% of patients require combination therapy to effectively attain their target blood pressure (Gradman et al., 2010).

The World Health Organization (WHO) has stated that ensuring adherence to both pharmacological and non-pharmacological treatment approaches are necessary for managing high blood pressure (WHO, 2023). Non adherence to prescribed medication has been reported as a major cause for uncontrolled blood pressure specifically among Asian population (Mahmood et al., 2020). According to the biopsychosocial approach, pathology and psychosocial traits like social support and self-efficacy in conjunction with biophysical components determines illness and health (Engel, 1977). Hence it may be said that motivation and self-efficacy are closely connected. Only when knowledge about the desired behaviour is fully developed, motivation operates effectively. The knowledge of the disease provides the drive to follow the prescribed treatment medicines and make essential lifestyle

modifications, thus making hypertension education the foremost key to achieve optimal blood pressure.

Need for Hypertension Awareness and Control in Children

The circulatory system, also referred to as the cardiovascular system, is an indispensable life-sustaining process that ensures the transportation of nutrients to cells, elimination of waste by-products, maintenance of pH levels, and nourishment of cell health. This process is carried out by the heart and blood vessels that are distributed throughout the body. The transportation of blood within the circulatory system requires the maintenance of an optimum pressure within the vessels. A well-functioning circulatory system is crucial to maintaining good health and quality of life. Hypertension, or high blood pressure, is a common health condition characterized by a consistent increase in the force exerted by blood on the walls of blood vessels, above the normal range. The continuous high pressure can weaken blood vessels, causing them to develop weak regions that can gradually develop into bulges (aneurysms), which could result in congestion, and rupture at any time. This rupture could induce blood leakage in the brain, leading to a stroke, and in severe cases, it could lead to a loss of life. Besides the risk of fatality, chronic high blood pressure is a high-risk cause of renal failure, vision loss, blood vessel damage, and cognitive impairment. Prolonged neglect of hypertension can result in the need for invasive and expensive surgeries such as carotid artery surgery, cardiac bypass surgery, and dialysis. These surgeries can significantly deplete individual and national budgets, affecting the overall wellbeing of the society. It is important to maintain a healthy lifestyle, regular exercise routine, and proper nutrition to keep hypertension at bay. Additionally, early detection of high blood pressure is crucial in preventing complications, and it can be managed with medications and lifestyle changes. It is

crucial to prioritize cardiovascular health, as the consequences of poor heart health can be severe and long-lasting.

Blood Pressure is measured in terms of systolic (the pressure when the heart pumps the blood) and diastolic (the pressure in between the pumping when the heart is at resting state). Systolic blood pressure beginning in childhood is also a high predictor of arterial stiffness in adults (Li et al., 2004). With a 4% global incidence, childhood hypertension poses a significant public health concern around the world (Song et al., 2019). The prevalence in India is at 7% (Meena et al., 2021). In the state of Telangana, a preventative medical screening survey of 980 school-aged children between 5 to 18 years indicated that a growing proportion of children were reported to be hypertensive, with their parents unaware of their child's hypertension status (Biswas, 2018). Hypertension in children can invariably damage the functioning of kidney, brain, and heart (Lurbe, 2007). A common cardiovascular risk factor in children, hypertension is associated with various negative health consequences, including elevated carotid intima media thickness, increased left ventricular mass, increased vascular thickness and stiffness, reduced endothelial function, and unfavorable changes to cardiac structure and function (Hill & Li, 2016; Khoury & Urbina, 2018). These health effects have a strong correlation with the incidence of critical cardiovascular disease outcomes in adulthood. When children with hypertension were tested for carotid intima-media thickness (CIMT) (a proxymeasure for the presence of cardiovascular health), it was found that it was significantly higher and independent of the effect of obesity (Lande et al., 2006). A stronger level of hypertension correlated with a higher CIMT. Obesity is also responsible for hypertension, which emphasises that excess body weight of children should also be scrutinised (Song et al., 2019). An overweight child has three times higher risk of developing hypertension than a child with a body mass index (BMI) in the normal range (Herouvi et al., 2013, as cited in Orlando et al., 2018). Obesity has also shown correlation

with the prevalence in increased left ventricular mass (a sign of cardiovascular end-organ damage) seen in 41% of hypertensive children (Henevold et al., 2004). Children whose family members are diagnosed with hypertension are also more likely to develop it (Bilal et al., 2020). Other risk factors in children include physical exercise, excessive use of technology, a high intake of junk food and aerated beverages, lengthy hours of study and academic stress, high salt intake, insufficient sleep, and an increase in sedentary behaviour (Biswas, 2018; Casas et al., 2018; Kelly et al., 2015).

Self-management is the most important and effective tool in any chronic illness management including hypertension (Abel et al., 2017; Williams et al., 2018). However, self-care in self-management often fails short because the person does not have an adequate knowledge causing non initiation of cognition translation into behaviour. Reported by George et al. (2014), among a group of 485 school children in New Delhi, India, who were studying in classes 6 to 8, pre-hypertension was found in 12.4% of the participants, stage 1 hypertension in 6.8% of participants and stage 2 hypertension in 1.4 % and yet only 25.4% of the total participants had adequate knowledge of cardiovascular risk factors. In a study by Hariharan et al. (2018), knowledge regarding hypertension among school children in grades 6 to 12 was insufficient. The study found that merely 11% of the students had knowledge about the implications of hypertension, management was understood by a similar percentage, and only 40% had a comprehensive understanding of its causes. Furthermore, the study highlighted that only a small proportion of the children were aware of the disease's potential. Sundar et al. (2013) in their study also indicated inadequate knowledge related to hypertension in school children where only 28.25% had awareness regarding hypertension and its complications. Divakaran et al. (2010) found that amongst school going children in Kerala, majority of the participants (84.8%) had very low awareness regarding lifestyle risk

factors of non-communicable diseases (NCDs). Only about 9.6% of these children were aware that cardiovascular diseases are preventable.

Hypertension Education and Hypertension Management

Minimizing risky behaviours and maximising health-promoting behaviours are key components of managing hypertension, which is heavily dependent upon self-management. Self-management is contingent upon strong conviction to change the current state that reduces dissonance between strong cognition and faulty behaviour. Through the inculcation of appropriate knowledge, a strong cognitive base is built. The learned resourcefulness model (Rosenbaum, 1990) theorised that a patient's cognitions influences their ability to self-regulate their health behaviour, which in turn affects their ability to manage their disease state. Several studies have indicated that knowledge could be a direct contributor to hypertension compliance and management (Alefan et al., 2019; Bs et al., 2011; Paczkowska et al., 2021; Ragavan et al., 2021).

A strong foundation of knowledge is to have awareness and clarity about the fundamentals of the disease state. Health education interventions provide opportunities for improving knowledge and comprehension of a disease condition, including redressal of doubts and reassurance of health anxieties towards the management of the disease. Beliefs about an illness can be favourably altered by health education interventions, which may then result in a change in behaviour. In a study by Sharma et al. (2014), significant improvement in participants' knowledge regarding hypertension and their adoption of healthy lifestyle practices related to hypertension was observed, following a hypertension education intervention. Research studies have shed light on the gap caused by poor hypertension education and self-management (Anchala et al., 2014; Busingye et al., 2019; Estrada et al.,

2020; González-fernández et al., 1990; Kassahun et al., 2020; Knight et al., 2001; Mohanty et al., 2021; Sudharsanan et al., 2021)

A study conducted among 404 individuals with hypertension evaluated their adherence to self-care practices such as taking prescribed medications and making necessary lifestyle changes. The study revealed that the overall adherence rate was only 23%. The findings also suggested that knowledge about the disease was significantly associated to the adherence factors observed among the participants (Tibebu et al., 2017). A study on 833 hypertensives in Chennai, India, found that treatment discontinuation was the most prominent cause of poor management as found in one third of the sample as compared to irregular use or non- initiation. This occurrence was found to have its root in incorrect knowledge towards treatment where most individuals believed that they could discontinue usage of medicine if their BP reading returned to normal (Sudharsanan et al., 2021). This in fact is dangerously supporting the fact that inadequate health beliefs can easily stimulate one to non-adherence in healthy lifestyle practices, consequently leading to life-threatening complications. More often, insufficient knowledge leads to a lack of awareness about the negative impacts of engaging in risky behaviours which can contribute to the development or worsening of hypertension. Tesema et al. (2016) conducted a study among 130 hypertensive patients in Ethiopia and found that the patients had poor knowledge and adherence with regards to making lifestyle changes and managing hypertension. Abu et al. (2018) has emphasized that that patients who had poor knowledge about hypertension were less inclined to modify their dietary habits, such as consuming nutritious food and decreasing their salt intake, in comparison to those who had a better knowledge about hypertension.

The lack of awareness suggests that there is an ardent need to start right at the base, that is, to formulate an intervention that targets to build cognition that would motivate a

desirable change in behaviour through better compliance. It has become clear that without the right foundational knowledge there cannot be a parallel change in adherence.

Designing a Health Education Intervention

Knowledge about disease is a crucial factor for better compliance. Designing an intervention that improves the control of elevated BP by overcoming misconceptions that drive non-compliance behaviour requires a good grasp of the level of hypertension knowledge. The knowledge about hypertension needs to be well researched and understood for hypertension to be successfully managed and controlled. There have been studies confirming that better knowledge leads to better lifestyle practices and reduces the incidence of complications and mortality regarding hypertension. A research study conducted by Ozoemena et al. (2019) involving 400 retirees revealed that a health educational intervention led to an improvement in hypertension knowledge and better prevention and self-care practices. This study indicates that the impact of the intervention is significant and has practical implications for public health. In other words, health education interventions can be beneficial for the wider community. In a cross-sectional and descriptive survey conducted by Rahimi and Nkombua (2022) it was found that 46% of the participants had uncontrolled hypertension yet also lacked knowledge regarding the disease and how to control it. The study suggested that assistance in terms of health education and motivation towards healthy lifestyle practices and modification should be a part of the consultation session with the physician. Educational interventions have proven to be useful in bringing about salt reduction and dietary changes through knowledge dissipation (Ajiboye et al., 2021). Park and Kim (2016) have established health education effectiveness of a nurse-led home visiting intervention on knowledge and behavioural practices to improve hypertension self management among older community-dwelling Koreans indicated through improvement in their knowledge scores and health promoting behaviour practice scores as well.

It is to say with confidence that knowledge interventions can be a very effective medium to bring about a basal cognitive change that hypertension is both preventable and manageable. Health education interventions can help to develop an adequate schema or modify the pre-existing notions related to the disease and motivate a change in behaviour through improvement in prescribed adherence strategies. This may not only have an immediate effect but in fact can guide a sustainable change in this direction. What remains to say is that this directional change would be most effective and sturdy when introduced at a stage of habit forming, or schema development about health. Given the stark statistics that inform of the impending hypertensive doom in current and future generations it is non-negotiable to build a healthy base of knowledge in childhood itself.

Health Education to Children

The importance of adopting healthy behaviours early on in life cannot be overstated, as it can greatly impact various aspects of an individual's overall health. While many children may be born healthy, their unhealthy behaviours may develop as they age. To promote optimal health, it is essential to take a life-course approach, which involves prioritizing efforts to maintain healthy habits from a young age, rather than waiting to address health concerns or risk factors in adulthood. This approach, also known as primordial prevention, emphasizes the significance of focusing on children to bring about positive changes in areas such as hypertension; focusing on children to bring about change, especially in the field of hypertension, primarily to engage them in self-help strategies of health behaviour.

Hypertension is not only prevalent in adults but also in adolescents, making it crucial to address its risk factors during childhood and adolescence. Such interventions can effectively delay the onset or progression of clinical hypertension and related cardiovascular diseases (Raj, 2014). The scientific community has acknowledged the shift from normative to elevated blood pressure levels in children and adolescents (Bartosh & Aronson, 1999;

Muntner et al., 2004; Song et al., 2019) highlighting the need to equip them with foundational health knowledge. The rising prevalence of hypertension can be attributed to modifiable behavioural contributors like poor dietary habits, urbanization, obesity, lack of physical activity, and social stress (Ibrahim, 2018). Previous studies have shown that childhood hypertension is linked to essential hypertension and risky cardiovascular events in adulthood (Bao et al., 1995; Beckett et al., 1992; Raitakari et al., 2003). It is a well-established fact that it is challenging for adults to make persistent lifestyle modifications, and medication-assisted risk factor reduction cannot fully restore optimal cardiovascular health. Thus, the desirable objective is to maintain better cardiovascular health throughout childhood (Steinberger et al., 2016). This emphasises the need of implementing worldwide initiatives and interventions aimed at preventing and managing hypertension early in life.

In a more generalized perspective, health education has been successful in enhancing the overall oral hygiene which includes gingival health and controlling plaque, among 12 to 15 year old school going adolescents in Nepal, utilizing an experimental group method. The adolescents in the experimental group of the study demonstrated a significant progress in their oral hygiene practices at both three and six months when compared to the baseline, while the control group did not exhibit any improvement. Additionally, the oral hygiene knowledge of the experimental group increased significantly by 77.51%, while the control group only showed an increase of 6.6% compared to the baseline. The experimental group also experienced a significant increase of 35.5% in their oral hygiene attitude and a significant improvement of 31.87% in their oral hygiene practices, while the control group demonstrated a decrease in both attitude and practices by 4.94% and 7.82%. Overall, the experimental group showed a significant increase of 54.58% in oral hygiene knowledge, attitude, and practices, while the control group exhibited almost no change. The study also

suggests that repeating and reinforcing health education programs play a critical role in maintaining healthy behaviours (Subedi et al., 2021).

In a study by Haque et al. (2016), oral health education was provided to 944 school students from a rural district in Bangladesh, who were in the 6th to 8th grade. The study found a significant improvement in knowledge, attitude, and practice scores after the educational intervention when compared to the baseline. The study also discovered that the educational intervention led to a considerable improvement in oral health practices, achieved by providing sufficient information, motivation, and practical measures to the participants. The intervention emphasized the importance of using fluoride toothpaste, increasing the frequency of tooth brushing to at least three times per day after each meal, and changing the toothbrush regularly. The children retained the knowledge and continued practicing good oral health habits even after six months post-intervention. The study also emphasizes the significance of sustaining healthy behaviour in the long term, as most interventions only have short-term effects. Srivastava et al. (2016) also conducted a study among 12-year-old children in Bengaluru, India. This study also found a significant improvement in both knowledge and practice of oral health among the participants after they received the health education intervention.

Other essential healthcare practices such as hand hygiene have observed similar trends of knowledge absorption through interventions and translation of knowledge into practice. This was possible even with kindergarten school children who were taught the importance of handwashing to avoid infectious diseases (Wu et al., 2022). This was done using an audio story following which children also learnt and sang a 7-step process of handwashing. This interactive and active learning approach deepened the children's understanding of hand hygiene and promotes preventive behaviour change. The children had lower bacterial colonization post intervention. Similarly, a health hygiene education

intervention along with nudge intervention among school children in Bangladesh found both interventions to be equally valuable with respect to sustained handwashing behaviour change 5 months post-intervention (Grover et al., 2018).

Relevant studies have shown that the shift in knowledge or behaviour, or both, brought about by the involvement of children in the management of a disease can be highly effective in promoting healthier lifestyles. It is essential to enhance knowledge and promote healthy lifestyle-related behaviour among children to prevent more serious health concerns in adulthood. As such, since the 1990s, children have been increasingly recruited for health intervention studies. One such study was conducted between 1995 and 1997 in Baltimore, involving urban primary school children who were part of a school-based interdisciplinary intervention to assess the impact of the intervention on their dietary intake and physical activity. Data was collected before and after implementation of the intervention. The study findings indicated a significant decrease in the percentages of total energy from fat and saturated fat among the children in the intervention schools. Consumption of fruits, vegetables, vitamin C, and dietary fiber also increased as a result of the intervention. Furthermore, television viewing was also marginally reduced after the interdisciplinary health intervention (Gortmaker et al., 1999). The success of this intervention demonstrates that exposing children to health education can enhance their knowledge regarding the benefits of healthy diet and lifestyle, leading to a positive change in their dietary habits and lifestyle choices. By promoting healthy habits from a young age, it is possible to prevent the development of serious health concerns in adulthood. Therefore, continued efforts to educate and involve children in health interventions are critical to promoting healthier lifestyles and reducing the risk of chronic diseases.

Preventive programs to reduce non-communicable diseases (NCDs) and its risk factors had also been undertaken in children and were proven to be effective in disease

management. In a study by Saraf et al. (2015) a school-based intervention was conducted in an experimental setup, among 2074 middle school children in 40 schools to enhance knowledge based behavioural practices such as diet modification, physical activity, and tobacco use. Knowledge of the group exposed to the intervention significantly increased following the intervention. Parallelly, the percentage of students in intervention group was higher than the control group to have an enhanced participation in physical training classes at least 5 days a week. Intervention group students also had improved fruit consumption, and reduced levels of smoking behaviour. It is important to note the method used in the intervention which was targeted at three levels—classroom, school, and family/community. Of particular relevance, the school level activities consisted of poster making of risk factors, flip chart sessions, health education lectures of about 30 minutes duration on various topics were hosted, flash films featuring an Indian parrot called 'Dr Hara Hari' was amusingly used to convey dangers of NCDs through stories. At the community level, educational material was circulated. This intervention promises an arena of conducive techniques and setting for favourable knowledge translation to school children.

Diet and nutrition play a critical role in managing hypertension, contributing to almost 30% of hypertension-related morbidity and mortality, as reported by the World Health Organization (WHO, 2023). Therefore, it is crucial to encourage young people to follow a healthy diet plan to prevent hypertension-related complications. Several school-based intervention programs have been conducted to promote healthy eating habits among children. One such study by Kebaili et al. (2014) was conducted on 2200 children aged between 12 to 16 years. The intervention program aimed to promote healthy nutrition, and it was found that there was a significant increase in knowledge, intentions, and behaviour towards healthy eating among the children following the intervention.

Another study conducted by Jung et al. (2019) emphasized on encouraging healthy diet for elementary school students. The program aimed to improve the students' knowledge regarding healthy eating and to encourage them to make healthier food choices. Results from the study showed a significant increase in healthy eating literacy among the students who participated in the program. They were able to understand the advantages of adhering to healthy eating habits, acquire practical skills to read food labels, and make healthier food choices. This healthy behaviour was also seen in their school lunch food choices, indicating their comprehension of the value of good health and nutrition. These intervention programs demonstrate that school-based intervention programs can play a significant role in promoting healthy nutrition habits among children and adolescents. Through these programs, children are not only able to learn about healthy eating habits but also develop practical skills to apply in their daily lives. Ultimately, such programs can help prevent hypertension and other chronic diseases by promoting healthy eating habits from an early age.

Encouraging children to reduce salt intake can potentially establish lifelong habits and attitudes towards hypertension management, as salt reduction is directly linked to managing hypertension. He et al. (2015) conducted a health education program in northern China aimed at reducing salt intake and promoting hypertension management in primary school children. The program aimed to educate children to encourage their families to reduce their salt intake. The results revealed that after 3.5 months, the program had a positive impact in decreasing salt consumption by 1.9 g/day (27%) in children and 2.9 g/day (25%) in adults. This reduction in salt intake led to a significant decrease in systolic blood pressure in adults. These findings demonstrate that the intervention was successful in reducing salt intake in both children and their families, providing a unique approach to preventing hypertension-related diseases by lowering population salt intake. The health education program has the potential to

establish lifelong healthy habits and attitudes towards salt reduction among children, which can persist into adulthood.

Another preventive program was conducted to combat non-communicable diseases by Ghammam et al. (2017) for children between 11 to 16 years to evaluate the long-term impact of school-based intervention program to prevent non-communicable diseases. The intervention saw a 3.2% significant rise in the consumption of vegetables and fruits in the children, whereas the control group witnessed a drop of almost 5% from baseline values. A decline in smoking habits was observed for the intervention group from 5.7% pre-assessment to 3.4% post assessment. This study emphasises on the efficacy of long-term intervention plans promoting healthy lifestyles.

Multiple interventions have been implemented for children to address various other risk factors associated with hypertension, resulting in notable improvements in their lifestyle behaviours. Ardic and Erdogan (2017) conducted a study to evaluate the effectiveness and long-term applicability of the “T-COPE Healthy TEEN Program” on Turkish adolescents' health. This program focused on developing a healthy lifestyle by incorporating techniques to enhance stress management, effective communication, self-esteem, goal setting, diet, and physical activity, including practice and role-playing. The program was administered once a week for 15 weeks and the adolescents from the intervention group displayed a significant enhancement in their dietary habits, stress management, and physical activity. These improvements were evident in terms of increased physical activity as measured by the amount of steps taken weekly, increased intake of fruits, vegetables, and water on a daily basis, and an increase in nutrition and physical activity-related knowledge. Furthermore, the participants experienced a decrease in body weight and symptoms of anxiety. The effectiveness of the program was maintained for 12 months. This indicates that the program is an effective intervention for improving the lifestyle practices of adolescents, which can

ultimately lead to the prevention and management of hypertension. Implementing such programs in schools can be an interesting approach to promoting healthy lifestyle habits among adolescents, who are at high risk of developing hypertension due to their changing lifestyles and diets. By instilling healthy habits early in life, children are more likely to maintain these practices throughout their lives, leading to better overall health outcomes.

Alongside the knowledge intervention on non-communicable diseases, it is desirable to inform the children on risk factors for non-communicable diseases. Obesity, smoking and sedentary lifestyle are some of the risk factors which the children acquire during the childhood and are unaware of their repercussions. Obesity is one condition among the urban middle and upper class children whose prevalence is of great concern. Obesity commonly begins in childhood or adolescence and predicts not only continuing obesity but also increased cardiovascular mortality (Twig et al., 2016) and infact has been linked to high blood pressure (Flynn, 2013; Wuehl, 2019). Theoretically, programs targeted at reducing obesity in childhood may have a double positive impact on both blood pressure and weight management. This has been demonstrated by Xu et al. (2015), in a multi component school-based program to combat childhood obesity in China among 1108 children. There were significant improvements in health behaviours and obesity-related knowledge. Compared with the control group, there were several changes in healthy behaviour such as increase in physical activity, decrease in sedentary activities, decreased consumption of red meat and mode of travelling to school/home. This brought a decrease in body mass index of the children. Brown et al. (2019) also emphasised that while physical activity interventions are beneficial for weight reduction in children when in combination with dietary interventions. Only dietary focused interventions were not found to be effective in bringing about any changes in the age group of teenagers.

Source reduction of damaging health habits can be countered with knowledge sharing and practice starting with children. Children can disseminate information to their households to bring about real changes in everyday life. Monteiro and Hariharan (2021) conducted a study to examine the effects of a hypertension-based educational intervention in children's and their family members' knowledge about hypertension. The study found that the intervention significantly improved both the children's and their family members' knowledge about hypertension. In addition to providing education, the intervention also incorporated a daily self-regulatory monitoring system to help children track their adults' behaviour, which contributed to a strong knowledge structure. The study's findings revealed a significant drop in blood pressure readings (both systolic and diastolic), indicating an improvement in compliance in the adults. These findings suggest that providing hypertension education intervention to children can have a positive impact on the health knowledge and health behaviours which could help in reducing hypertension rates.

Another community-based intervention study in Brazil involving healthy lifestyle information among randomized 6-10 years old was proven to be effective in reducing the cardiovascular risk in their parents. The study included a control group which received written educational materials on healthy living for their parents, and an intervention group which received a weekly educational program conducted by a multidisciplinary team, in addition to the written materials. The study's findings showed that after one year, the intervention group exhibited a significant 91% decrease in their intermediate/high cardiovascular risk, in contrast to the control group's 13% drop. These results suggest that incorporating children into health promotion programs can be a successful strategy for reducing cardiovascular risk in families (Fornari et al., 2013).

Psychosocial Aspects of Knowledge Retention and Knowledge Transmission

Researchers have identified that children actively practice good health behaviours once they are properly educated (Haque et al., 2019; Jung et al., 2019; Kebaili et al., 2014). However, several factors can impact their ability to do so. Pulimeno et al. (2020) stated that school environments are highly conducive to promoting health education. In the context of knowledge retention and transmission, motivation is important because it can influence how much effort an individual is willing to put into learning and practicing new information. Children are born eager to learn. They have an inborn motivation to learn new things. Children's enthusiastic curiosity doesn't diminish over time. One way to enhance a child's potential for learning is to provide them with enriching experiences. These experiences can stimulate and engage their brain, leading to the creation of new neural pathways and the strengthening of existing ones. By engaging in activities that challenge them, children can use their brain-power to reorient learning pathways, making them more efficient and effective at processing new information. Thus, by exposing children to a wide range of experiences that are both stimulating and engaging, we can help to give their learning potential a boost, setting them up for greater success in the future. Self-determination theory (SDT) research strongly advocates the significance of motivation and its nature as a fundamental aspect of healthy psychological development (Ryan & Deci, 2000). According to this theory, motivation has a crucial role in fostering a positive relationship with healthy weight control behaviour and academic achievement in adolescents. Conversely, lack of motivation and poor academic performance are predictive of risk factors for lifestyle diseases (Veloso et al., 2012). These findings emphasize the importance of motivation in promoting healthy behaviours and managing potential health problems. On the other hand, personality traits can influence an individual's learning style and preferences. For example, individuals who are more introverted may prefer independent learning and self-paced courses, while individuals who

are more extroverted may prefer group learning and interactive sessions. Personality traits such as openness to experience and conscientiousness can impact an individual's ability to adopt new behaviours and integrate new knowledge into their daily routine. Conscientiousness and openness has been shown to enhance the efficacy of various learning strategies, and may be particularly beneficial in attaining high academic achievement. (Marcela, 2015). Research has shown that students who achieve higher grades tend to have better skills in analyzing, retaining, and retrieving information compared to those who receive lower grades. Specifically, a study by Gadzeella and Baloglu (2003) found that high-achieving students exhibit stronger abilities in deep processing and fact retention, in contrast to their low-achieving counterparts. These findings provide empirical evidence for the association between academic performance and cognitive abilities, highlighting the crucial role of academic achievement in the development of effective information processing skills.

Health education interventions to children benefit from incorporating a variety of teaching strategies to promote knowledge retention, transfer, and application. The use of learning theories which includes the strategies of practice with conceptual understanding, comparative scenarios, and clear roadmaps for learning, are particularly effective in this context. Effectiveness of these types of educational interventions depends on the level of knowledge retention. Knowledge retention is the amount of information a person retains over a specific time period (i.e., between an initial learning test and a retention test) (Bruno et al., 2007). Learners' levels of knowledge retention may vary depending on the different educational approaches and intervention strategies applied. In a school-based hypertension education intervention study by Semou and Monteiro (2022), a 30 minute video based education intervention was given to school children from class 7 to class 10 to improve the level of knowledge regarding hypertension, its causes, risk factors, and management. The intervention was repeated again 14 days after the first exposure. The study revealed

significant increase in the school children knowledge regarding hypertension following intervention. The participants were also able to retain the knowledge gained even after 10 months post-intervention. This study also shows that a video-based health educational intervention is an effective form of intervention in term of its long-term impact among school children of this study.

Theoretical Framework

Hypertension can have serious and detrimental effects on a person's well-being, including physical health, emotional wellbeing, and even mortality. Additionally, the negative impact of hypertension during childhood can persist into adulthood, leading to severe health problems. However, it is important to note that with persistent and dedicated efforts, the likelihood of these negative outcomes can be minimized. To enhance their well-being and mitigate the risks related to hypertension, individuals can proactively take steps to manage the condition through lifestyle modifications and medical interventions. In order to effectively manage chronic diseases in children, it is essential to establish a team capable of delivering relevant educational content and integrating it with socio-emotional cues that empower children to harness their full potential. Several behavioural interventions have been developed, incorporating various theories including health belief model, information motivation-behavioural skills model, trans-theoretical model, theory of planned behaviour, and the theory of reasoned action. These models identify behavioural determinants that can be potentially modified to facilitate behavioural change.

The Information-Motivation-Behavioural Skills Model, proposed by Fisher and Fisher (1992), has been effective in improving adherence or self-management among children and adolescents with chronic diseases (Bakir et al., 2021). The model comprises three constructs, namely information, motivation, and behavioural skills. To implement the model effectively,

disease-specific and behaviour-specific information should be made available through educational videos, handouts, diaries, and interactive discussions. Personal motivation can be boosted by encouraging positive feelings and attitudes towards behaviour change in children, who are generally more motivated than adults. Social motivation can be fostered by providing group-based information, personal feedback, and reflective listening. Objective skills can be translated into behavioural interventions, which can be reinforced through repeated follow-up visits and assessments of knowledge tests. The duration of the intervention is also important in predicting the long-term sustainability of behavioural change. A study conducted by Ardic and Erdogan (2017) reported sustained behavioural changes even 12 months after the intervention was delivered for 15 weeks. Therefore, incorporating the Information-Motivation-Behavioural Skills Model and employing appropriate educational strategies can help in the effective management of chronic diseases in children.

The intervention proposed for this study also fits well with the Health Belief Model (Rosenstock, 1974) which explains health behaviour change is heavily dependent on one's perceptions about their health. The major tenets of this theory—perceived severity, perceived susceptibility, perceived benefits, perceived barriers, cues to action, and self-efficacy—outlines factors that determine one's willingness to change their health status. 'Perceived severity' of the illness implies the likelihood in inviting the dangerousness of the disease primarily because of the lack of understanding of the disease and its risk. If there is an impending vulnerability to acquire the disease—perceived susceptibility—it will in fact generate motivation in the individual to engage in preventive behaviour. 'Perceiving benefits' such as engaging in health behaviour that would prove to be effective; versus 'perceiving barriers' such as low self-efficacy or any disengaging individual or relational factors could also determine one's intention to change to healthy behaviour. 'Cues to action' is the actual shift from intention to practice. 'Self-efficacy' or the confidence in oneself to be able to make

the change in health behaviour is also very crucial in determining its effectiveness of the change. The primary motive of any health education intervention formulated for children should target these variables that would help implement a health behaviour change. The cognitive component of the health education intervention itself is directed to enhance perceived severity and perceived susceptibility of the disease. Discussion of the impending consequences on failure to adopt these changes and the improvement in cardiac health aim to satisfy the perceived benefits and perceived barriers to prime health changes. A health psychologist would greatly facilitate the cues to action by evaluation of simultaneous healthy lifestyle practice and aid the confidence in children that they are being rightly guided through the change and that they are navigating in the right direction. Understanding the theoretical principles behind any motivated change can greatly impact the efficacy of the intervention.

Rationale

Hypertension is a risk factor and a risk with its asymptomatic features and untimely diagnosis. Tackling hypertension may seem simple but is a challenge even for the adults' posing threats to adherence levels and resulting in poor cardiac health and mortality. A novel approach to the rising cases of paediatric and adult hypertension is to be able to make changes during childhood itself. Creating a strong and clear foundational knowledge in children with logical approaches to corrective and preventive measures can have a lasting impact throughout their lifespan. Managing the disease can be simple and effective if it is incorporated as a lifestyle change at a habit-forming stage of life, that is, childhood. This adaptation can provide the much needed relief on health care burdens at an individual and national level.

The research questions for this study were formulated based on the review of the literature. Based on these research questions, the objectives and hypotheses were formulated.

Research Questions

The research problem of the study are presented in the following statements

1. Does hypertension education intervention enhance the hypertension knowledge which is retained over a period of time?
2. Does hypertension education intervention have a differential impact on early adolescents and late adolescents?
3. What are the psychosocial factors that contribute to knowledge enhancement following hypertension education intervention?
4. Does hypertension education intervention bring a positive change in healthy lifestyle practices among the school children?
5. What are the psychosocial factors that contribute to a positive change in healthy lifestyle practices in school children?

Hypotheses

Following hypotheses are drawn on the basis of review of literature and researcher's observation

1. Hypertension education intervention will enhance hypertension knowledge which will be retained over a period of time in school children.
2. Hypertension education intervention will have a differential impact on hypertension knowledge between early adolescents and late adolescents.

3. Following hypertension education intervention, psychosocial factors will positively contribute to enhancing the hypertension knowledge levels in school children.
4. Hypertension knowledge will bring a positive change in healthy lifestyle practices among school children.
5. Hypertension education intervention will have a differential impact on healthy lifestyle practices between early adolescents and late adolescents.

Objectives

Primary Objective

1. To find out the effect of hypertension education intervention on hypertension knowledge levels of school children across the time

Secondary Objectives

1. To examine the differential impact of hypertension education intervention on hypertension knowledge between early and late adolescents
2. To examine if the hypertension education intervention will bring a change in the healthy lifestyle practices in school children
3. To assess the differential impact of the hypertension education intervention on healthy lifestyle practices between early adolescents and late adolescents
4. To identify the psychosocial factors that contribute to enhancing hypertension knowledge levels
5. To identify the psychosocial factors contributing to healthy lifestyle practices following hypertension education intervention in school children

Chapter III

METHOD

Chapter III

METHOD

This chapter provides an in-depth description of the research problem, hypothesis, objectives, the pilot study, plan, design, and sample of the study, measures used, and the procedure that was followed to reach the objective of the study.

Plan and Design

The study adopted a quasi–experimental interrupted time series design (Biglan et al., 2000), by employing the pre-test post-test intervention design. The study was planned on 500 school children from class 6 to class 10 from the town of Kohima and Dimapur in Nagaland. In the pre-test, the participants' hypertension knowledge and healthy lifestyle practices were measured. Apart from this, they were also administered personality test and achievement motivation test, as a one-time administration to measure various psychological and social parameters. The marks of the immediately preceding examination were obtained from the records to measure the academic performance of the participants. Following this, they were exposed to the hypertension education through a video clipping for a duration of 30 minutes, which was repeated a week after the first exposure. In order to test the immediate, short - term and long - term impact of the hypertension education intervention on the participants, their hypertension knowledge was tested immediately after the first exposure, then thereafter at a gap of 14 days, 35 days, 63 days, and 91 days after the first exposure of the hypertension education intervention. The post-test of healthy lifestyle practices was held at a gap of 91 days after the first exposure to the intervention.

Table 3.1 presents the entire plan and design in a comprehensive form.

Table 3.1

Design of the Study

Pre-test	Day 1	8th day	14th day	35th day	63th day	91th day
	Post-test 1		Post-test 2	Post-test 3	Post-test 4	Post-test 5
1. Hypertension knowledge 2. Healthy lifestyle practices	Hypertension education intervention (first exposure)	Hypertension education intervention (second exposure)	Hypertension knowledge	Hypertension knowledge	Hypertension knowledge	Hypertension knowledge & Healthy lifestyle practices
One time Psychosocial tests 1. Personality 2. Achievement Motivation						

Participants

The sample was drawn from three schools from Kohima and Dimapur district of Nagaland following purposive sampling. All the students from class 6 to class 10 studying in the three schools were included in the study. Later those children who were not present on the day of intervention or consistently not present to take the post tests were dropped from the sample.

The number of participants from the classes in the selected schools totalled to 503. Out of these, a total of 80 participants dropped out due to their absence on the days of testing or intervention. The remaining 423 participants constituted the sample.

Details of the Participants

The distribution of the sample according to the demographic characteristics is displayed in table 3.2.

Table 3.2

Demographic Characteristics of the Participants

Class	Male		Female		Total	
	N	*%*	*N*	*%*	*N*	*%*
6	41	51.25	39	48.75	80	18.90
7	33	47.83	36	52.17	69	16.30
8	27	42.19	37	57.81	64	15.10
9	52	47.71	57	52.29	109	25.80
10	42	41.58	59	58.42	101	23.90
Total	195	46.10	228	53.90		

Note. N = 423

The sample consists of 423 school children. The children belonged to Class 6 (18.09%), Class 7 (16.30%), Class 8 (15.10%), Class 9 (25.80%), and Class 10 (23.90%); and comprised of 195 male (46.10%) and 228 female (53.90%). The class wise gender distribution is presented in table 3.2. The participants of the study were in the age range of 10 to 17 years (M = 13.91; SD = ± 1.737).

Measures

The study used four self-reporting paper-pencil measures for the baseline and follow-up assessments, namely, Hypertension Knowledge Test (HKT), Healthy Lifestyle Practice Scale for Children and Adolescents (HELIPSCA), Big Five Questionnaire - Children version (BFQ-C), and Achievement Motivation Inventory (AMI). Detailed information about the

measures regarding the psychometric properties, administration, scoring, content, and development (where applicable) is discussed below. Additionally, examination marks (total marks' percentage) was also recorded from the school register.

Personal Details Form

A participant information form was used to collect demographic information including the participant's name, class, age, gender, and contact details such as address, phone number, and email ID. Participants' previous year's promotion examination mark (total marks' percentage) was also recorded using this form. To avoid repetition of participant information in each measure, this form was used. After recording their information, each participant was assigned a unique identification (ID) number. This ID number was then included on every measure administered to ensure accurate identification and tracking of individual participant responses. A copy of this form is enclosed in appendix B5.

Hypertension Knowledge Test (HKT)

The Hypertension Knowledge Test (HKT), developed by Andrew and Hariharan (2017), is a questionnaire designed to assess the level of knowledge about hypertension. It consists of 22 multiple-choice items. All the statements in the questionnaire are accompanied by five options each, of which only one is correct. Participants are instructed to read each statement and choose the correct answer from the five given options. The 22 items are categorized into four domains. These domains include general awareness of hypertension (consisting of five items), lifestyle factors (consisting of five items), causes, care, casualty, and awareness of hypertension (consisting of six items), and management of medication (consisting of six items). The test –retest reliability of the test was found to be high (α = 0.92). Cronbach's α reported for the study was 0.74.

Scoring. For each item in the Hypertension Knowledge Test (HKT), a correct answer was given a score of 1, while an incorrect answer received a score of 0. Domain scores were calculated by adding the scores of items within each respective domain. The General Awareness domain consisted of five items (Items 1, 2, 4, 9, and 17), with scores ranging from 0 to 5. The Lifestyle factors domain comprised five items (Items 5, 6, 7, 10, and 16), with scores ranging from 0 to 5. The Causes, Care, Casualty, and Awareness domain comprised of six items (Items 3, 8, 19, 20, 21, and 22), with scores ranging from 0 to 6. Lastly, the Management of Medication domain consisted of six items (Items 11, 12, 13, 14, 15, and 18), with scores ranging from 0 to 6. The subtotal scores of each domain are added up to obtain the overall Hypertension Knowledge Test (HKT) score, which ranged from 0 to 22. Higher scores indicated a higher level of knowledge regarding hypertension.

Healthy Lifestyle Practice Scale for Children and Adolescents (HELIPSCA)

This scale was specifically developed for this study. Scale development meticulously followed the prescribed steps of item pooling, item writing, item analysis, validation and pilot testing and item pruning. The scale consisted of 28 items and all the items were retained for use in the main study since it has achieved good reliability, validity, and internal consistency. Therefore, the final scale consists of 28 items and aims to measure daily healthy lifestyle practices in children. This scale was employed in the study to evaluate the health behaviour of the participants. The scale consist of items related to dietary habits, physical activity or exercise, quality of sleep or rest, screen time, hygiene practices, and spiritual practices. A total of nine items (3, 4, 10, 14, 15, 16, 18, 19 and 22) are positively worded. 19 items (1, 2, 5, 6, 7, 8, 9, 11, 12, 13, 17, 20, 21, 23, 24, 25, 26, 27 and 28) are negatively worded. The Cronbach's α of the tool was found to be 0.70.

Scoring. Participants' responses are measured using a 4-point Likert scale ranging from Almost always = 4 to Never = 1. For positive items, the scoring involves 4 = Almost always, 3 = Frequently, 2 = Rarely and 1 = Never. It is scored reversely for negative statements. A higher score indicates a healthier lifestyle, reflecting positive choices in an individual's lifestyle.

Big Five Questionnaire – Children Version (BFQ – C)

The Big Five Questionnaire - Children version (BFQ-C) contains 65 items which measure the five factors of personality in children and adolescents. It measures personality traits related to the Big Five factors, namely, energy or extraversion, agreeableness, conscientiousness, emotional instability or neuroticism, and intellect or openness. The scale was developed by Barbaranelli et al. (2003). It consists of a total of 65 items, with each of the five factors represented by 13 items. The specific items under each factor are as follows: Items 1, 9, 14, 19, 23, 26, 35, 40, 42, 50, 55, 57, 63 for Energy or Extraversion, Items 2, 11, 13, 16, 21, 27, 32, 38, 45, 47, 51, 60, 64 for Agreeableness, Items 3, 7, 20, 22, 25, 28, 34, 37, 44, 48, 53, 56, 65 for Conscientiousness, Items 4, 6, 8, 15, 17, 29, 31, 39, 41, 49, 54, 58, 61 for Emotional instability or Neuroticism, and Items 5, 10, 12, 18, 24, 30, 33, 36, 43, 46, 52, 59, 62 for Intellect or Openness. The Cronbach's α for this study was found to be 0.86.

Scoring. Participants' responses are measured using a 5-point Likert scale ranging from Almost always = 5 to Almost never = 1. The score for each personality factor is calculated by summing the scores of the 13 items within that specific dimension. The possible score range for each factor is from 13 to 65. Higher the score, greater is the dominance of the particular personality factor.

Achievement Motivation Inventory (AMI)

This scale was developed by Muthee and Thomas (2009). It consists of 32 items and was specifically designed to assess the achievement motivation of school children in India, making it a suitable measure given the cultural context in which it was created. Of the 32 items, 18 are positively worded (Items 3, 4, 6, 11, 13, 14, 16, 17, 20, 23, 24, 26, 28, 29, 30, 31, and 32), while the remaining 14 items are negatively worded (Items 1, 2, 7, 8, 9, 10, 12, 15, 18, 19, 21, 25, and 27). The scale demonstrates good internal consistency, as indicated by a Cronbach's α coefficient of 0.75. The validity of the scale is supported by its resemblance to other well-established inventories used to measure achievement motivation. Cronbach's α was found to be 0.65 for this study.

Scoring. Participants' responses are measured using a 5-point Likert scale ranging from completely agree = 5 to completely disagree = 1. For positive items, the scoring involves 5 = completely agree, 4 = mostly agree, 3 = agree to some extent, 2 = mostly disagree and 1 = completely disagree. It is scored reversely for negative statements. The total score obtained by summing all the items on the scale indicates the level of achievement motivation in school children. A higher score indicates a higher level of achievement motivation.

Intervention

The study participants received intervention in the form of audio-visual educational modules and interactive discussions.

Hypertension Knowledge and Management Informational Video. The informational video consists of a 30-minute clip featuring a medical doctor who discusses hypertension using a slideshow containing images and animations. The video aims to educate

about uncontrolled hypertension, prevalence, associated risks, and most importantly, the lack of awareness surrounding this chronic disease, which often leads to inadequate management and negative health outcomes. It displays the disease's approximative onset age, probable symptoms, potential negative effects in the event of uncontrolled hypertension, and the physical state of hypertension-affected individuals. The video also showed how to take blood pressure readings and understand blood pressure recordings while promoting the importance of adhering to a doctor's medicines' prescriptions, the risks of substituting or missing a dose, and the significance of making dietary and lifestyle adjustments. The viewer is also taught how to recognise symptoms in the event that a person's blood pressure rises above its limit and they need emergency medical care. The importance of adherence and the consequences of non/low adherence were emphasised.

Procedure

Ethical Clearance and Permissions

Prior to initiating the pilot study, approval was obtained from the Institutional Ethics Committee at the University of Hyderabad (IEC approval number: UH/IEC/2021/176). The ethical approval is enclosed as appendix B1. The study utilized measures obtained from the public domain, and hence permission from the respective authors was not sought. The selection of the data collection location took into consideration the researcher's convenience in terms of language and geographic coverage, resulting in the selection of two districts, Kohima and Dimapur, in the state of Nagaland. Using references, several school principals and headmasters were contacted to gauge their interest in participating in the study. The interested schools were then approached to discuss the study's design, and a letter of request from the supervisor was provided to seek written permission for conducting the study (Appendix B2). The first three schools that responded were taken as the sample of the study.

Upon receiving approval from the school heads, a teacher was assigned to work with the investigator at each school, helping establish a rapport with the students and facilitating data collection. A pilot study was carried out to assess the feasibility of the research tools and intervention module before proceeding with the main study.

Pilot Study

To assess the feasibility of the interventional study, a pilot study was carried out. And a number of aspects of the data collection process were also evaluated, including testing the measures, participant enrolment and dropout rates, time required to administering the intervention sessions and measures, the relevance of consent forms, participant enrolment and dropout rates, schedule formulation, and time required to administer sessions. All of these aspects helped in identifying the potential sample and enhancing the key aspects of the main study. The pilot study provided an invaluable opportunity to familiarize oneself with all the components of the study, serving as a valuable learning experience. Further details of the study are presented below.

Method. The pilot study was conducted on a sample of 100 children belonging to classes 7 through 10 from one school. After obtaining the informed consent from parents and assent from the children, the administration of pre-test of Hypertension Knowledge Test, Healthy Lifestyle Practice Scale for Children and Adolescents, followed by the one-time tests of Big Five Questionnaire - Children version, and Achievement Motivation Inventory were administered. The total marks' percentage of the previously held examination of each student was recorded from the school record. This was followed by the Hypertension Education Intervention on the next day and then a week later. Immediate administration of Hypertension Knowledge Test following the first and second exposure to intervention followed by post-test of Hypertension Knowledge Test was conducted two weeks after the second exposure and

then 10 months after the second exposure. The last post-test was delayed due to closure of schools due to COVID 19. Along with the Hypertension Knowledge Test, the children were also administered the Healthy Lifestyle Practice Scale for Children and Adolescents in the final post-test.

Reliability and validity of the measures were established before proceeding with the main study. The results of the pilot study suggested that the measures were working well with the sample. Hence, all the measures used in the pilot study were retained for the main study. In addition, the pilot test experience helped in planning the pre-test, post-test schedules, organising the time-table and orienting the teacher who assisted in the study.

Main Study

The pilot study provided valuable insights that contributed to the enhancement of the main study without compromising the study's objectives. The study's design was finalized (Refer Table 3.1). Several schools were approached to participate, and ultimately three schools agreed to take part. These schools were similar in that they were all English medium schools and served students from middle socioeconomic backgrounds.

The study was carried out in two phases: first in Dimapur, Nagaland from February to May 2022, and then in Kohima, Nagaland from May to August 2022. To ensure the study ran smoothly, a timetable was created together with the teacher in charge. This helped to avoid any delays caused by conflicting schedules. The finalized timetable was flexible enough to accommodate various situations, such as when a student was unavailable due to exams, holidays, or school functions. In such cases, adjustments were made by coordinating with the teacher in charge and rescheduling the study on other working days. Table 3.1 that presented the plan and design presents the exact day order on which the follow ups were done.

Process of Recruitment

To start the study, efforts were made to establish a good rapport with all students in Class 6 to Class 10. They were informed about the study and were given an assent form (Appendix B4) along with a consent form for their parents or guardians (Appendix B3). This step was necessary as the students were all under the age of 18 and required parental or guardian consent to participate. The assent and consent form featured extensive information about the study and as well as the dates of the pre-intervention assessments, intervention sessions, and follow-ups. The students were instructed to return the signed consent forms to the school the following day. This was done to estimate the number of participants who would be present for the study.

Pre - Intervention Assessment

The pre-intervention assessment process was conducted one day before the intervention's scheduled date. In the pre-test, the participants' hypertension knowledge and healthy lifestyle practices were measured. Apart from this, they were also administered personality test and achievement motivation test, as a one-time administration to measure various psychological and social parameters. The total marks' percentage of each student from the immediately preceding examination was obtained from the school records to measure the academic performance of the participants and participants' demographic information was also obtained using the personal details/information form. The pre-test questionnaires consisted of the Hypertension Knowledge Test, Healthy Lifestyle Practice Scale for Children and Adolescents, Big Five Questionnaire – Children version, and Achievement Motivation Inventory. The tests were administered in groups of each class. The aims, timeframe, protocol of the study, as well as their role in the study were explained to the students. Any doubts from the students were resolved individually. The personal information

form and other pre-test questionnaires were then given to each subject; however, they were asked to attend these only after being provided instructions. To maintain a tranquil atmosphere, it was ensured that no more than two students were seated next to each other. Participants were then instructed to start recording their responses in the forms provided to them after completing preliminary procedures. They were asked to raise their hands if they have any doubts in understanding the statements in the questionnaires. After each participant completed filling up their responses, the forms were collected from them. They were then provided with a debriefing session regarding the upcoming stages of the study and were requested to be present on the days of the intervention exposures and follow-up assessments. This entire session took approximately 1 hour for each class. Participants who were unable to comply with the time constraints were accommodated individually.

Intervention and Follow-up Assessments

The study schedule was organized in a manner where the participants would receive their intervention exposure on the day following the pre-intervention assessments. The students were gathered for the first exposure to the intervention (Day 1). Specific arrangements were made with the school for the intervention, including the provision of an LCD projector screen for video display, speakers and microphone for clear audio, and adequate seating arrangements for all students. On the first day of the intervention, a 30-minute educational video on hypertension was presented to the students. The video was displayed on a large screen, with a 10-minute break provided to help the children process the new information and maintain their attention. The in-charge teacher was present throughout facilitating the sessions and ensuring clear communication between the students and the investigator. Following the conclusion of the audiovisual session, the students were given a hypertension knowledge test (HKT) to evaluate the intervention’s immediate impact then a discussion was also held to recap the content of the session and address any questions or

concerns raised by the participants. They were reminded of the next session date. This intervention session lasted approximately 1 hour and 20 minutes. For the second exposure (Day 8), the children were assembled in the same setting as before. And the same hypertension education video was presented to them in the same manner as during the first exposure. The purpose of showing the same intervention video repeatedly was to instil in children a firm cognitive base regarding hypertension. This intervention session took approximately 1 hour. After this intervention session, hypertension knowledge test was conducted again four times at a gap of 14 days, 35 days, 63 days, and 91 days after the first exposure to the intervention to measure knowledge retention. In the final post-test session, along with Hypertension Knowledge Test (HKT) the students were administered on Healthy Lifestyle Practice Scale for Children and Adolescents (HELIPSCA) to observe knowledge transmission to practice. Each follow up post-test sessions took approximately 30 minutes to complete. The teacher in charge, school authorities, and staffs who contributed to the study's smooth administration were thanked for their assistance and support on the last day of the study. It is essential to highlight the role of the teachers who were in charge of the study because they were familiar with the students and offered any technical help. The roles of these teachers were crucial in facilitating communication between the researcher and the schools. Additionally, they ensured that students arrived on time for the session by preparing and reminding them in advance; this tremendously assisted in preventing any lapse in data collecting process.

Chapter IV

RESULTS

Chapter IV

RESULTS

This chapter describes the findings obtained from the analysis of the data. The primary objective of the study is to find out the effect of hypertension education intervention on hypertension knowledge levels of school children across the time. Following are the secondary objectives.

1. To examine the differential impact of hypertension education intervention on hypertension knowledge between early and late adolescents
2. To examine if the hypertension education intervention will bring a change in the healthy lifestyle practices in school children
3. To assess the differential impact of the hypertension education intervention on healthy lifestyle practices between early adolescents and late adolescents
4. To identify the psychosocial factors that contribute to enhancing hypertension knowledge levels
5. To identify the psychosocial factors contributing to healthy lifestyle practices following hypertension education intervention in school children

Towards these objectives, a series of statistical analysis were carried out using the IBM SPSS software version 26. The results are discussed in three parts. Part 1 of the results examine the primary objective, that is, the sustainability of knowledge gain impacted by hypertension education intervention across time in school children belonging to classes from 6^{th} to 10^{th}. Part 2 of the results examines the effect of hypertension knowledge education intervention on healthy lifestyle practices in children. Part 3 of the results identify the psychosocial factors contributing to the gain in hypertension knowledge, and positive change in healthy lifestyle practices of children following the intervention.

Part 1

Sustainability of Hypertension Knowledge Gain Across Time

Children were exposed to hypertension education intervention twice. In order to meet the primary objective of the study, it was required to determine if the hypertension education intervention provided to the school children had significantly improved their level of knowledge across the time. It may be reiterated here that the children were administered Hypertension Knowledge Test (HKT) six times; once one day prior to the intervention (pre-test) and then immediately after the first exposure to the intervention (post-test 1), thereafter at a gap of 14 days (post-test 2), 35 days (post-test 3), 63 days (post-test 4), and 91 days (post-test 5) after the first exposure of the hypertension education intervention.

In order to examine the change in the knowledge levels, the differences between the pre-intervention scores and the five post-intervention scores were statistically examined. Towards this objective, five repeated measures One Way Analysis of Variance (Repeated measures ANOVA) was carried out taking the overall knowledge scores as well as the scores of its dimensions. The results are presented in Table 4.1

Table 4.1

Differences in Hypertension Knowledge Total Score and its Four Dimensions Between the Pre-test and the Five Post-test Scores at Various Time Intervals (n = 423)

Variables	Pre-test		Post-test 1		Post-test 2		Post-test 3		Post-test 4		Post-test 5			
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*(5,2110)	η2
HK (Total score)	3.91	3.22	10.97	4.40	11.33	4.24	10.78	4.34	10.62	4.35	11.10	4.69	527.15***	.56
HK (General awareness)	1.05	1.14	3.20	1.31	3.29	1.29	3.20	1.18	3.17	1.23	3.25	1.25	401.51***	.49
HK (Lifestyle)	0.88	1.06	2.60	1.44	2.75	1.40	2.43	1.42	2.44	1.39	2.53	1.46	229.57***	.35
HK (Causes, care, casualty, and awareness)	1.04	1.12	2.29	1.34	2.21	1.28	2.09	1.27	1.98	1.16	2.19	1.39	95.51***	.19
HK (Management of medication)	0.94	1.09	2.87	1.61	3.08	1.61	3.06	1.64	3.04	1.66	3.12	1.69	262.27***	.38

*Note. * = p<.05; ** = p<.01; *** = p<.001;* HK = Hypertension Knowledge.

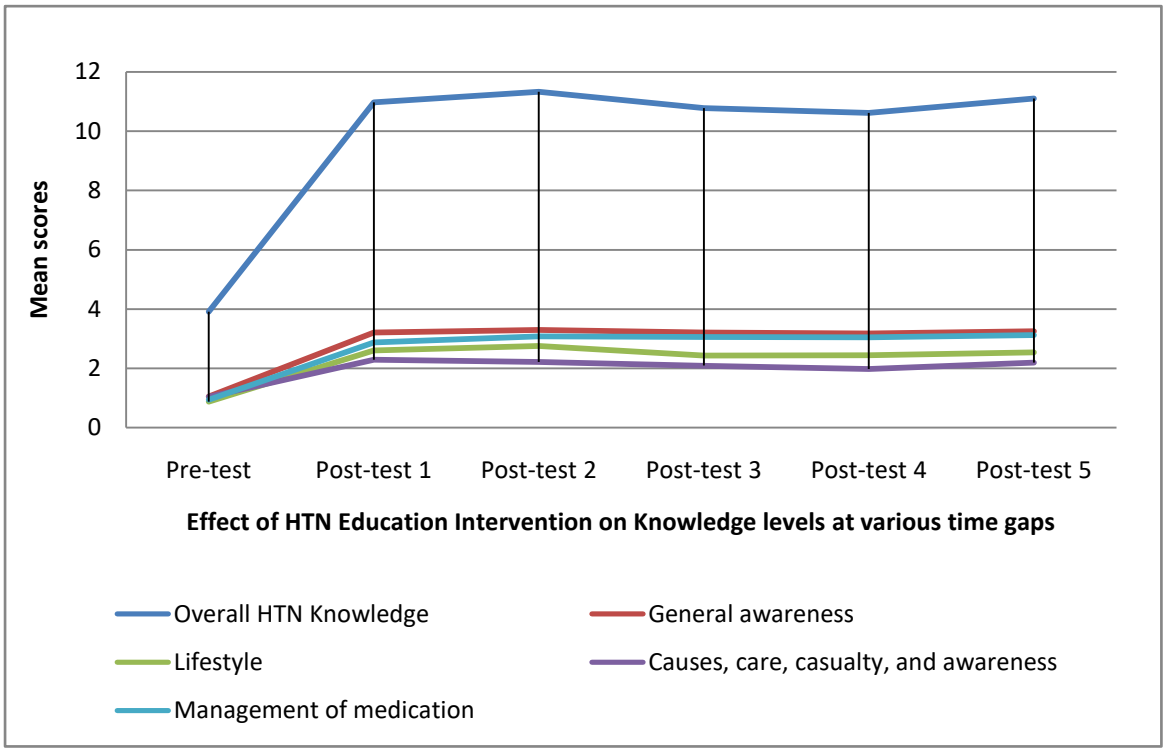
Table 4.1 presents the results of five repeated measures ANOVAs that assessed differences in scores amongst overall hypertension knowledge and its dimensions. Scores relate to the six tests that includes the pre-test (before exposure to the intervention), post-test 1 (immediately after the first exposure to the intervention), post-test 2 (14 days after the first exposure to the intervention), post-test 3 (35 days after the first exposure to the intervention), post-test 4 (63 days after the first exposure to the intervention) and post-test 5 (91 days after the first exposure to the intervention). Findings indicated significant mean differences in overall hypertension knowledge across six time periods F (5, 2110) = 527.15, $p < .001$ and across all the four dimensions, namely, general awareness—F (5, 2110) = 401.51, $p < .001$, lifestyle—F (5, 2110) = 229.57, $p < .001$, causes, care, casualty & awareness—F (5, 2110) = 95.51, $p < .001$, and management of medication— F (5, 2110) = 262.27, $p < .001$.

Thus, the findings revealed a significant intervention effect on the knowledge levels of the school children across the time span ranging from immediate to 91 days after the first exposure to the intervention, suggesting an increase in the level of retention of knowledge. A significant increase in overall hypertension knowledge levels and its domains after exposure to the intervention was demonstrated in the results. This indicates that hypertension education intervention was successful in improving the overall knowledge as well as the knowledge levels in particular domains related to hypertension.

The visual representation of the results is depicted in figure 4.1.

Figure 4.1

Improvement in Overall Hypertension Knowledge Levels and its Dimensions Across Time



Note. Line graph representation of improvement in overall hypertension knowledge levels and its dimensions across time.

Observation from the overall hypertension knowledge scores as visualized in Figure 4.1 shows a slight drop in the overall knowledge level in the third post-test (35 days after the first exposure to the intervention) which picked up again in the fifth post-test (91 days after the first exposure to the intervention). This is a natural trend as per the Ebbinghaus' (1885) theory of forgetting where the curve of memory retention eventually drops in the absence of active recall. The same trend showing improvement in retention of information specific to each domain of hypertension knowledge is also observed which remains similar to the overall hypertension knowledge levels. The drop and a pick up in the curve also conforms with the phenomenon of spontaneous recovery discussed by Pavlov (1927).

It is pertinent to compare the scores of every test (pre-test and five post-tests) with every other test scores to find out the significant difference in knowledge levels between the pre-test and different post-tests and every post test with every other post-test conducted at different time gaps. This would give an insight about the drop or gain in knowledge levels between the time gaps. For this purpose, Bonferroni multiple group comparison tests are carried out. The scores of pre-intervention tests are compared with every post-intervention test. Further each post-intervention test scores is compared with every other post-intervention test. The results are presented in table 4. 2.

Table 4.2

Results of Bonferroni Multiple Group Comparisons on Hypertension Knowledge Total Score and its Dimensions' Scores at Different Time Points

Multiple comparisons	HK (Total Score)	HK (General awareness)	HK (Lifestyle)	HK (Causes, care, casualty, and awareness)	HK (Management of medication)
Pre-test ~ Post-test 1	-7.05*	-2.15*	-1.72*	-1.25*	-1.93*
Pre-test ~ Post-test 2	-7.41*	-2.24*	-1.88*	-1.17*	-2.14*
Pre-test ~ Post-test 3	-6.87*	-2.15*	-1.56*	-1.05*	-2.12*
Pre-test ~ Post-test 4	-6.71*	-2.12*	-1.56*	-.94*	-2.09*
Pre-test ~ Post-test 5	-7.19*	-2.20*	-1.66*	-1.14*	-2.18*
Post-test 1 ~ Post-test 2	-0.36	-.085	-.15	.08	-.20
Post-test 1 ~ Post-test 3	-0.18	0.002	.17	.19*	-.18
Post-test 1 ~ Post-test 4	0 .35	0.0	.16	.31*	-.16
Post-test 1 ~ Post-test 5	-0.13	-0.05	.07	.10	-.25*
Post-test 2 ~ Post-test 3	0.54*	0.09	.32*	.12	.02
Post-test 2 ~ Post-test 4	0.70*	.12	.31*	.23*	.04

Multiple comparisons	HK (Total Score)	HK (General awareness)	HK (Lifestyle)	HK (Causes, care, casualty, and awareness)	HK (Management of medication)
Post-test 2 ~ Post-test 5	0.29	.03	.22*	.02	-.05
Post-test 3 ~Post-test 4	0.16	.03	-.01	.11	.02
Post-test 3 ~ Post-test 5	-0.32	-.06	-.09	-.09	-.07
Post-test 4 ~Post-test 5	-.48*	-.09	-.09	-.29*	-.09

Note. * = $p<.05$; HK = Hypertension Knowledge.

Table 4.2 shows the mean difference between pre-test and post-test 1 through post-test 5 as well as differences between different combinations of post-tests for hypertension knowledge test - the overall and for each of the dimensions. Results show a significant difference between pre-test and each post-test in overall knowledge and all the four dimensions. This indicates that the education intervention following the pre-test has a significant improvement in the knowledge levels which is retained across time.

A scrutiny of table 4.2 depicting the mean scores reveals that the overall hypertension knowledge pre-test scores (M = 3.91, SD = 3.22) are significantly low compared to the knowledge levels of post-test 1 (M = 10.97, SD = 4.40), post-test 2 (M = 11.33, SD = 4.24), post-test 3 (M = 10.78, SD = 4.34), post-test 4 (M = 10.62, SD = 4.35), and post-test 5 (M = 11.10, SD = 4.69). Besides this, in the overall knowledge, post-test 2 (M = 11.33, SD = 4.24) differed significantly from post-test 3 *(*M = 10.78, SD = 4.34) and post-test 4 (M = 10.62, SD = 4.35). Post-test 4 (M = 10.62, SD = 4.35) showed significant low scores compared to post-test 5 *(*M = 11.10, SD = 4.69). Post-test 3 did not differ significantly from post-test 1, 4 and 5 while it differed significantly from post-test 2, where the post-test 2 showed a higher mean score compared to post-test 3. This highlights that there was a significant improvement in the levels of knowledge after every assessment, except a dip seen between post-test 2 and post-test 3 which was already explained.

Similarly, hypertension knowledge levels of the participants in the domain general awareness significantly increased from the pre-test (M = 1.05, SD = 1.14) to post-test 1 (M = 3.20, SD = 1.31), post-test 2 (M = 3.29, SD = 1.24), post-test 3 (M = 3.20, SD = 1.18), post-test 4 (M = 3.17, SD = 1.23), and post-test 5 (M = 3.25, SD = 1.25). There is significant change in the knowledge levels across the post test score measures indicating that increased knowledge in this domain was retained post intervention exposures.

In comparison with the pre-test scores of the lifestyle domain of hypertension knowledge (*M* = 0.88, *SD* = 1.06) there was a significant increase in the post test scores, that is, post-test 1 (*M* = 2.60, *SD* = 1.44), post-test 2 (*M* = 2.75, *SD* = 1.40), post-test 3 (*M* = 2.43, *SD* = 1.42), post-test 4 (*M* = 2.44, *SD* = 1.40), and post-test 5 (*M* = 2.53, *SD* = 1.46). Furthermore, there was a significant specific fall in the lifestyle related knowledge between post-test 2 *(M* = 2.75, *SD* = 1.40) and post-test 3 (*M* = 2.43, *SD* = 1.42) between post-test 2 *(M* = 2.75, *SD* = 1.40) and post-test 4 (*M* = 2.44, *SD* = 1.40), and between post-test 2 *(M* = 2.75, *SD* = 1.40) and post-test 5 (*M* = 2.53, *SD* = 1.46).

Post-test hypertension knowledge levels of the participants in the domain—causes, care, casualty, and awareness significantly increased in comparison with the pre-test (*M* = 1.04, *SD* = 1.12). Though marginal decline was observed progressively from post-test 1 (*M* = 2.29, *SD* = 1.34), post-test 2 (*M* = 2.21, *SD* = 1.28), post-test 3 (*M* = 2.09, *SD* = 1.27), post-test 4 (*M* = 1.98, *SD* = 1.16), there was still a significantly high score in post-test 5 (*M* = 2.19, *SD* = 1.39) compared to the pre-test. There was a significant specific drop between post-test 1 (*M* = 2.29, *SD* = 1.34) and post-test 3 (*M* = 2.09, *SD* = 1.27), post-test 1 (*M* = 2.29, *SD* = 1.34) and post-test 4 (*M* = 1.98, *SD* = 1.16), post-test 2 (*M* = 2.21, *SD* = 1.28) and post-test 4 (*M* = 1.98, *SD* = 1.16), while a significant increase between post-test 4 (*M* = 1.98, *SD* = 1.16) and post-test 5 (*M* = 2.19, *SD* = 1.39). This increase in post-test 5 indicates what is called the spontaneous recovery.

In comparison with the pre-test (*M* = 0.94, *SD* = 1.09) hypertension knowledge levels of the participants in the dimension management of medication also significantly increased in post-test 1 (*M* = 2.87, *SD* = 1.61), post-test 2 (*M* = 3.08, *SD* = 1.61), post-test 3 (*M* = 3.06, *SD* = 1.64), post-test 4 (*M* = 3.04, *SD* = 1.66), and post-test 5 (*M* = 3.12, *SD* = 1.69). The pair wise comparison between post-test 1 (*M* = 2.87, *SD* = 1.61) and post-test 5 (*M* = 3.12, *SD* = 1.69) showed a significant increase in hypertension knowledge levels of the participants in

the domain management of medication. This suggests a significant increase in retention of knowledge in medication management between post-test 1 and post-test 5.

Differential Impact of the Hypertension Education Intervention on Hypertension Knowledge in Early Adolescents and Late Adolescents

Two – way ANOVA were carried out to see if there is a differential impact of the intervention on hypertension knowledge before and after hypertension education intervention (pre-test and post-test) between the two age categories of the participants (early adolescents and late adolescents). The results did not show any significant differences.

Part 2

Changes in Healthy Lifestyle Practices Among the School Children Before Intervention and After Intervention

Part 2 of the results presents the findings related to healthy lifestyle practices of the school children before and after their exposure to hypertension education intervention. The assumption behind this is that the education intervention extensively dealt with the close inter-relationship between hypertension and lifestyle. Hence, if the education intervention was successful in laying a strong cognitive foundation, then the cognitive base should be translated to behaviour showing a change in their lifestyle. This should reflect in the differences between healthy lifestyle practices before and after the education intervention.

Prime among the secondary objective of the study was to examine if the hypertension education positively influenced healthy lifestyle practices in school children. The pre-test for healthy lifestyle practices was conducted one day prior to the intervention and the post-test for healthy lifestyle practices was taken at a gap of 91 days after the first exposure to the

intervention. A paired *t* – test was conducted between pre and post – intervention scores of healthy lifestyle practices. The results are shown in table 4.3.

Table 4.3

Differences in Healthy Lifestyle Practices Before Intervention and After Intervention (n = 423)

Outcome	Before Intervention		After Intervention				
	M	*SD*	*M*	*SD*	*t(422)*	*p*	Cohen's *d*
Healthy Lifestyle Practices	77.90	8.88	78.85	8.58	2.45*	.015	0.11

*Note. * = p <.05.*

From table 4.3 it is revealed that the mean comparison of healthy lifestyle practices before hypertension education intervention (*M* = 77.90, *SD* = 8.88) and after hypertension education intervention (*M* = 78.85, *SD* = 8.58) was significantly different. Cohen's *d* was 0.11 (<0.50) which indicated small effect size. Thus, it may be said that the hypertension education intervention positively influenced the healthy lifestyle practices of school children. Having found that the participants significantly differed in their lifestyle practices before and after the hypertension education intervention, it is logical to inquire whether these differences are uniform across the age groups or whether intervention had differential impact on different age groups of the participants. Further analysis related to this is explained below.

Differential Impact of the Hypertension Education Intervention on Healthy Lifestyle Practices in Early Adolescents and Late Adolescents

An attempt was made to investigate if there is a differential impact of the intervention on healthy lifestyle practices before and after hypertension education intervention (pre-test and post-test) between the two age categories of the participants (early adolescents and late adolescents). A two-way mixed method ANOVA was carried out. The results of ANOVA are presented in table 4.4, while the means and standard deviations are presented in table 4.5.

Table 4.4

Summary Table of Two-way ANOVA on Healthy Lifestyle Practice Scores of the Participants (n = 423)

Sources	Type III Sum of Squares	df	Mean Square	F	η^2
Intervention (A)	136.56	1	136.56	4.32*	.01
Age category (B)	616.90	1	616.90	5.16*	.012
Intervention * Age category	45.22	1	45.22	1.43	
Error	13303.21	421	31.60		

Note. ANOVA = analysis of variance; Intervention= pre-intervention and post-intervention; Age category - early adolescents = 10 – 14 year olds; late adolescents = 15 – 17 year olds; * = $p < .05$.

Table 4.5

Means and Standard Deviations of Healthy Lifestyle Practices in Early Adolescents and Late Adolescents Before and After Hypertension Education Intervention (n =423)

Groups	Pre – intervention		Post – intervention		Total	
	M	*SD*	*M*	*SD*	*M*	*SD*
Early Adolescents	78.39	9.42	79.69	9.14	158.08	16.57
Late Adolescents	77.10	7.88	77.45	7.36	154.55	13.44
Total	77.90	8.88	78.85	8.58		

Note. Early Adolescents = 10 - 14 year olds; Late Adolescents = 15 - 17 year olds.

A two- way ANOVA was conducted to explore the impact of intervention and age on healthy lifestyle practices. Participants were divided into two groups based on the scores before and after intervention (pre-test and post-test) and age groups (early adolescents and late adolescents). Table 4.4 reveals that the interaction effect was not statistically significant F (1, 421) = 1.43, $p > .05$. There was a statistically significant main effect for intervention on healthy lifestyle practices F (1, 421) = 4.32, $p < .05$. However, the main effect was small (partial eta squared = .01). The mean score for the participants on healthy lifestyle practices in the post-test (M = 78.85, SD = 8.58) was significantly higher compared to the pre-test (M = 77.90, SD = 8.88). There was a statistically significant main effect of age groups on healthy lifestyle practices F (1, 421) = 5.16, $p < .05$; however, the main effect was small (partial eta squared =.01). The mean score for healthy lifestyle practices for early adolescents (M = 79.69, SD = 9.14) was significantly higher compared to late adolescents (M = 77.45, SD =

7.36). This indicates that the effect of hypertension education intervention was significant in bringing a positive change in the healthy lifestyle practices of the participants. Further, the findings also indicate that the impact of the intervention is relatively high on early adolescent group compared to the late adolescent group.

Now that the findings established that the hypertension education intervention was effective and sustainable over time and that it is translated into healthy lifestyle practices, particularly so among the early adolescent group, it is the researcher's inquisitiveness to explore and identify, factors other than the intervention that impacted the sustenance of knowledge and translation of the gain in knowledge to healthy lifestyle practices. Part 3 of the results presents the findings in this regard.

Part 3

Psychosocial Factors Predicting Post-Intervention Hypertension Knowledge

The results of ANOVA and Bonferroni tests indicate significant differences between the pre and post intervention scores in hypertension knowledge, there may be factors other than the hypertension knowledge intervention which must have contributed to the increase in the knowledge level in a gap of 91 days. It was thought appropriate to identify these factors contributing to the hypertension knowledge measured in the final post-test 91 days after the first exposure to the intervention. In order to identify various factors contributing to hypertension knowledge in children following education intervention, all demographic factors (viz., Age, Gender, Class), and all psychosocial factors (viz., Examination Mark, Achievement motivation, Big five personality traits, and the fifth post-test of Hypertension knowledge) were taken into consideration for using step-wise Multiple Regression Analysis. As a pre-requisite, Pearson Product Moment Correlation was computed between these variables. The result of correlation analysis is presented in Table 4.6.

Table 4.6

Correlation Matrix of the Study Variables

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Gender															
2	Age	-0.06														
3	Class	0.06	0.83**													
4	Examination mark	0.16**	-0.30**	-0.13*												
5	Achievement motivation	0.13**	-0.27**	-0.19**	0.28**											
6	BF (Extraversion)	-0.07	-0.03	-0.06	0.05	0.21**										
7	BF (Agreeableness)	0.04	0.04	0.02	0.13**	0.18**	0.49**									
8	BF (Conscientiousness)	0.09*	0.02	0.04	0.16**	0.41**	0.46**	0.56**								
9	BF (Neuroticism)	0.24**	-0.03	0.00	0.12*	0.15**	0.18**	0.11*	0.21**							
10	BF (Intellect/Openness)	0.02	-0.08	-0.11*	0.13**	0.41**	0.47**	0.48**	0.61**	0.16**						
11	HK5P (General awareness)	0.13**	-0.10*	0.05	0.38**	0.04	0.07	0.17**	0.14**	0.03	0.04					
12	HK5P (Lifestyle)	0.16**	-0.06	0.11*	0.39**	0.07	0.04	0.11*	0.06	-0.01	0.05	0.52**				
13	HK5P (Causes, care, casualty, and awareness)	0.15**	-0.14**	-0.02	0.37**	0.04	-0.02	0.13**	0.05	-0.07	-0.02	0.55**	0.51**			
14	HK5P (Management of medication)	0.10*	0.04	0.19**	0.35**	-0.01	0.04	0.09	0.04	0.03	-0.02	0.56**	0.58**	0.52**		
15	HK5P (Total score)	0.17**	-0.07	0.11*	0.46**	0.04	0.04	0.15**	0.08	-0.01	0.01	0.79**	0.81**	0.79**	0.84**	

Note. BF = Big five personality trait; HK5P = Hypertension Knowledge fifth post-test; * = $p < .05$, ** = $p < .01$.

It is observed from table 4.6 that the overall hypertension knowledge has significant correlation with four variables— Gender ($r = 0.17$, $p < 0.01$), Class ($r = 0.11$, $p < 0.01$), Examination mark ($r = 0.46$, $p < 0.01$), and Big five personality trait - Agreeableness ($r = 0.15$, $p < 0.01$). In the case of the domains of hypertension knowledge, the domain General awareness has significant correlation with five variables – Gender ($r = 0.13$, $p < 0.01$), Age ($r = -0.10$, $p<0.05$), Examination mark ($r = 0.38$, $p < 0.01$), among the Big five personality traits – Agreeableness ($r = 0.17$, $p < 0.01$), and Conscientiousness ($r = 0.14$, $p < 0.01$). The domain Lifestyle has significant correlation with four variables – Gender ($r = 0.16$, $p < 0.01$), Class ($r = 0.11$, $p < 0.01$), Examination mark ($r = 0.39$, $p < 0.01$), and Big five personality trait – Agreeableness ($r = 0.11$, $p < 0.05$). The domain Causes, care, casualty, and awareness has significant correlation with four variables – Gender ($r = 0.15$, $p < 0.01$), Age ($r = -0.14$, $p < 0.01$), Examination mark ($r = 0.37$, $p < 0.01$), and Big five personality trait – Agreeableness ($r = 0.13$, $p < 0.01$). The domain Management of medication has significant correlation with 3 variables – Gender ($r = 0.10$, $p < 0.05$), Class ($r = 0.19$, $p < 0.01$), and Examination mark ($r = 0.35$, $p < 0.01$).

Stepwise regression analyses were conducted to identify the predictors of hypertension knowledge levels overall and across the domains as assessed in the fifth post-test assessment. The assumptions of normality, linearity and homoscedasticity were checked and established for every model. Absence of multicollinearity was confirmed through tolerance values and VIF (variance inflation factor) which were found to be above .01 and below 10, respectively.

The four correlated variables (viz., Gender, Class, Examination mark, and Big five personality trait – Agreeableness) were used as predictors for the overall hypertension knowledge levels and the results are presented in table 4.7.

Table 4.7

Psychosocial Factors Predicting Post - Intervention Overall Hypertension Knowledge

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = 3.12, F = 111.12***)					.21	.21	.21***
Examination mark	.14	.01	.46	10.54***			
Model 2 (C = -1.77, F = 65.36***)					.23	.24	.03***
Examination mark	.14	.01	.48	11.13***			
Class	.55	.14	.17	3.97***			

Note. * = p<0.05, ** = p<0.01, *** = p<0.001, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change.

Table 4.7 shows multiple step wise regression analysis. The first model shows Examination mark as a single predictor, significantly explaining 21% variance (R^2 change = .21) in hypertension knowledge [F (1, 421) = 111.12, p < .001]. In the second model, Class was added; and along with Examination mark it predicted 24% variance (R^2 change = .03) in hypertension knowledge [F (2, 420) = 65.36, p < .001]. The results indicate that the class that the children belonged to and the marks they obtained in the examination significantly predicted the overall hypertension knowledge retention over 91 days. It may be mentioned here that both these factors are connected to the cognitive level and functioning of the participant. Thus, the cognition seems play to an indirect but important role here.

Subsequently, the correlated variables (viz., Gender, Age, Examination mark, and Big five personality traits – Agreeableness and Conscientiousness) were used as predictors for the

General awareness domain of hypertension knowledge and the results of multiple regression analysis are presented in table 4.8.

Table 4.8

Psychosocial Factors Predicting Hypertension Knowledge in the Dimension General Awareness

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = 1.50, F = 69.98***)					.14	.14	.14***
Examination mark	.03	.004	.38	8.37***			
Model 2 (C =.68 , F = 38.92***)					.15	.16	.02***
Examination mark	.03	.004	.36	8.01***			
Agreeableness	.02	.008	.12	2.62**			

Note. * = p<0.05, ** = p<0.01, *** = p<0.001, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change.

Table 4.8 shows multiple step wise regression analysis. The first model shows Examination mark as a single predictor, significantly explaining 14% variance (R^2 change = .14) in hypertension knowledge domain General awareness [F (1, 421) = 69.98, p < .001]. In the second model, Big five personality trait – Agreeableness was added; and along with Examination mark it predicted 16% variance (R^2 change = .01) in hypertension knowledge domain General awareness [F (2, 420) = 38.92, p < .001]. The results indicated that two

factors, namely, Examination mark and Big five personality trait - Agreeableness, significantly contributed in predicting the variance to the extent of 16% hypertension knowledge level in the domain General awareness among the school children of the study. This suggests that both examination mark indicative of cognitive competence and a certain personality disposition indicated by agreeableness are two necessary factors that contribute to improved knowledge retention following educational intervention on hypertension.

The four correlated variables (viz., Gender, Class, Examination mark, and Big five personality trait – Agreeableness) were used as predictors for the hypertension knowledge domain Lifestyle and the result is presented in table 4.9.

Table 4.9

Psychosocial Factors Predicting Hypertension Knowledge in the Dimension Lifestyle

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = .39, F = 77.85***)					.15	.16	.16***
Examination mark	.04	.004	.40	8.82***			
Model 2 (C = -1.004 , F= 46.13***)					.18	.18	.02***
Examination mark	.04	.004	.42	9.31***			
Class	.16	.05	.16	3.51***			

Note. * = p < 0.05, ** = p < 0.01, *** = p < 0.001, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change.

Table 4.9 presents the results of multiple step wise regression analysis. The first model shows Examination mark as a single predictor, significantly explaining 16% variance (R^2 change = .16) in hypertension knowledge domain Lifestyle [F (1, 421) = 77.85, $p < .001$]. In the second model, Class was added; and along with Examination mark it predicted 18% variance (R^2 change = .02) in hypertension knowledge domain called Lifestyle [F (2, 420) = 46.13, $p < .001$]. The results indicated that two factors, namely, Examination mark and Class, significantly contributed to the extent of explaining 18% variance in hypertension knowledge level in the domain Lifestyle.

The four correlated variables (viz., Gender, Age, Examination mark, Big five personality trait – Agreeableness) were used as predictors for the hypertension knowledge domain Causes, Care, Casualty, and Awareness and the result is presented in table 4.10.

Table 4.10

Psychosocial Factors Predicting Hypertension Knowledge in the Dimension Causes, Care, Casualty, and Awareness

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = .30, F = 64.57***)					.13	.13	.13***
Examination mark	.03	.004	.37	8.04***			
Model 2 (C = -.03 , F = 34.77***)					.14	.14	.01*
Examination mark	.03	.004	.35	7.62***			
Gender	.27	.13	.10	2.11*			

Note. * = p < 0.05, ** = p < 0.01, *** = p < 0.001, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change.

Table 4.10 shows the results of multiple step wise regression analysis. The first model shows Examination mark as a single predictor, significantly explaining 13% variance (R^2 change = .13) in hypertension knowledge domain Causes, care, casualty, and awareness [F (1, 421) = 64.57, p < .001]. In the second model Gender was added; and along with Examination mark it predicted 14% variance (R^2 change = .01) in hypertension knowledge level in the domain Causes, care, casualty, and awareness [F (2, 420) = 34.77, p <.001]. The result indicated that two factors, namely, Examination mark and Gender, positively significantly contributed to hypertension knowledge level in the domain Causes, care, casualty, and awareness among the school children of the study.

The three correlated variables (viz., Gender, Class, and Examination mark) were used as predictors for the hypertension knowledge domain Management of medication. The result is presented in table 4.11.

Table 4.11

Psychosocial Factors Predicting Hypertension Knowledge in the Dimension Management of Medication

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = .93, F = 57.78***)					.12	.12	.12***
Examination mark	.04	.005	.35	7.60***			
Model 2 (C = -1.57 , F = 45.43***)					.17	.18	.06***
Examination mark	.04	.005	.38	8.46***			
Class	.28	.05	.24	5.40***			

Note. * = p < 0.05, ** = p < 0.01, *** = p < 0.001, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change.

Table 4.11 shows multiple step wise regression analysis to identify predictors for Management of medication of hypertension knowledge. The first model shows Examination Mark as a single predictor, significantly explaining 12% variance (R^2 change = .12) in hypertension knowledge domain Management of medication [F (1, 421) = 57.78, p < .001]. In the second model, Class was added; and along with Examination mark it predicted 18%

variance (R^2 change = .06) in hypertension knowledge of the domain Management of medication [F (2, 420) = 45.43, $p < .001$]. The results indicated that two factors, namely, Examination mark and Class, significantly contributed in predicting 18% variance in the hypertension knowledge level in the domain of Management of medication among the school children of the study.

Psychosocial Factors Predicting Healthy Lifestyle Practices 91 Days After Hypertension Education Intervention

An attempt was made to identify the psychosocial factors that contribute to enhancing the healthy lifestyle practices in children following hypertension education intervention. Multiple regression analyses were taken up. The positive impact in healthy lifestyle practices after 91 days of first exposure to the intervention could have contributions from several demographic and psychosocial factors apart from the intervention itself. In order to identify the various factors contributing to healthy lifestyle practices in children following hypertension education intervention, all demographic factors (viz., Age, Gender, and Class) and all psychosocial factors (viz., Examination mark, Achievement motivation, Big five personality traits, and the pre-test and fifth post-test of Hypertension knowledge), were taken into consideration and were included in the step-wise Multiple Regression Analysis. As a pre-requisite, Pearson Product Moment Correlation was computed between these variables. The result of correlation analysis is presented in Table 4.12.

Table 4.12

Correlation Matrix of the Study Variables (n = 423)

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	Gender																				
2	Age	-0.06																			
3	Class	0.06	0.83**																		
4	Examination mark	0.16**	-0.30**	-0.13*																	
5	Achievement motivation	0.13**	-0.27**	-0.19**	0.28**																
6	BF (Extraversion)	-0.07	-0.03	-0.06	0.05	0.21**															
7	BF (Agreeableness)	0.04	0.04	0.02	0.13**	0.18**	0.49**														
8	BF (Conscientiousness)	0.09*	0.02	0.04	0.16**	0.41**	0.46**	0.56**													
9	BF (Neuroticism)	0.24**	-0.03	0.00	0.12*	0.15**	0.18**	0.11*	0.21**												
10	BF (Intellect/Openness)	0.02	-0.08	-0.11*	0.13**	0.41**	0.47**	0.48**	0.61**	0.16**											
11	HK5P (General awareness)	0.13**	-0.10*	0.05	0.38**	0.04	0.07	0.17**	0.14**	0.03	0.04										
12	HK5P (Lifestyle)	0.16**	-0.06	0.11*	0.39**	0.07	0.04	0.11*	0.06	-0.01	0.05	0.52**									
13	HK5P (Causes, care, casualty, and awareness)	0.15**	-0.14**	-0.02	0.37**	0.04	-0.02	0.13**	0.05	-0.07	-0.02	0.55**	0.51**								
14	HK5P (Management of medication)	0.10*	0.04	0.19**	0.35**	-0.01	0.04	0.09	0.04	0.03	-0.02	0.56**	0.58**	0.52**							
15	HK5P (Total score)	0.17**	-0.07	0.11*	0.46**	0.04	0.04	0.15**	0.08	-0.01	0.01	0.79**	0.81**	0.79**	0.84**						

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
16	HLP (Post-test)	0.08	-0.14**	-0.09	0.07	0.15**	0.06	0.18**	0.15**	-0.26**	0.06	0.14**	0.06	0.20**	0.02	0.12*					
17	Pre-HK (General awareness)	.028	-.04	.003	.19**	.02	.03	.05	.04	.03	.06	.24**	.22**	.18**	.23**	.27**	-.06				
18	Pre-HK (Lifestyle)	.10*	.002	.11*	.26**	.08	.02	.05	.07	.03	.09	.21**	.32**	.21**	.25**	.30**	-.10*	.40**			
19	Pre-HK (Causes, care, casualty, and awareness)	.11*	.03	.15**	.17**	.09	.07	.09	.12*	.04	.12*	.16**	.21**	.19**	.21**	.24**	-.09	.40**	.41**		
20	Pre-HK (Management of medication)	.07	.03	.10*	.18**	.06	.03	.06	.07	.07	.05	.20**	.16**	.20**	.24**	.25**	-.10*	.33**	.33**	.40**	
21	Pre-HK (Total score)	.10*	.01	.12*	.27**	.08	.05	.08	.10*	.06	.11*	.28**	.31**	.27**	.31**	.36**	-.12*	.74**	.73**	.76**	.70**

Note. BF = Big five personality trait; HK5P = Hypertension Knowledge fifth post-test; HLP = Healthy Lifestyle Practices; Pre-HK = Pre-test of Hypertension Knowledge; * = $p < .05$, ** = $p < .01$.

It is found from table 4.12 that 11 variables showed a significant correlation with healthy lifestyle practices. The correlated variables are Age (r = -0.14, p < 0.01), among the Big five personality traits—Agreeableness (r = .18, p < 0.01), Conscientiousness (r = 0.15, p < 0.01), Neuroticism (r = -0.26, p < 0.01); Achievement motivation (r = 0.15, p < 0.01), hypertension knowledge fifth post-test in the dimension General awareness (r = 0.14, p < 0.01) , the dimension Causes, care, casualty, and awareness (r = 0.20, p < 0.01), Overall hypertension knowledge fifth post-test (r = 0.12, p < 0.05), Overall hypertension knowledge pre-test scores (r = -0.12, p < 0.05), hypertension knowledge pre-test scores in the dimension Lifestyle (r = -0.10, p < 0.05), and in the dimension Management of medication (r = -0.10, p < 0.05).

Multiple stepwise regression analysis was conducted to identify the predictors of healthy lifestyle practices as assessed in the post intervention follow up of 91 days after the first exposure to the hypertension education intervention.

The 11 correlated variables (viz., Age, among the Big five personality traits—Agreeableness, Conscientiousness, and Neuroticism, Achievement motivation, hypertension knowledge fifth post-test in the dimension General awareness, the dimension Causes, care, casualty, and awareness, Overall hypertension knowledge fifth post-test, Overall hypertension knowledge pre-test scores, and hypertension knowledge pre-test scores in the dimension Lifestyle and in the dimension Management of medication) were used as predictors for healthy lifestyle practices (post-intervention) and the result is presented in table 4.13.

Table 4.13

Psychosocial Predictors of Healthy Lifestyle Practices in Post - Intervention Phase

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Model 1 (C = 92.67, F = 29.72***)					.06	.07	.07***
Neuroticism	-.36	.07	-.26	-5.45***			
Model 2 (C = 82.99 , F = 25.81***)					.11	.11	.04***
Neuroticism	-.39	.06	-.28	-6.03***			
Agreeableness	.24	.05	.21	4.53***			
Model 3 (C = 93.96, F = 21.81***)					.13	.14	.03***
Neuroticism	-.40	.06	-.29	-6.23***			
Agreeableness	.25	.05	.22	4.73***			
Age	-.79	.23	-.16	-3.52***			
Model 4 (C = 91.03, F = 18.97***)					.15	.15	.01**

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Neuroticism	-.38	.06	-.27	-5.98***			
Agreeableness	.23	.05	.20	4.29***			
Age	-.69	.23	-.14	-3.08**			
HK5P (Causes, care, casualty, and awareness	.86	.28	.14	3.03**			
Model 5 (C = 90.62, F = 18.25***)					.17	.18	.03***
Neuroticism	-.36	.06	-.26	-5.76***			
Agreeableness	.24	.05	.20	4.50***			
Age	-.66	.22	-.13	-2.96*			
HK5P (Causes, care, casualty, and awareness	1.14	.29	.19	3.93**			
PHK (Total score)	-.45	.12	-.17	-3.63**			
Model 6 (C = 79.51, F = 16.99***)					.19	.20	.02**
Neuroticism	-.38	.06	-.28	-6.14***			

Model	B	SE	β	t	**Adjusted R^2**	**R^2**	**ΔR^2**
Agreeableness	.21	.05	.18	3.91***			
Age	-.46	.23	-.09	-2.00*			
HK5P(Causes, care, casualty, and awareness)	1.17	.29	.19	4.08***			
PHK (Total score)	-.47	.12	-.18	-3.87***			
Achievement motivation	.10	.04	.14	2.99*			

Note. * = $p < 0.05$, ** = $p < 0.01$, *** = $p < 0.001$, C = Constant, B = Unstandardized beta coefficient, SE = Standard error, β = Standardized beta coefficient, t = t values of beta, ΔR^2 = R^2 change, HK5P = Hypertension Knowledge fifth post-test; PHK = Pre-test of Hypertension Knowledge.

Table 4.13 shows multiple step wise regression analysis to identify the significant predictors of healthy lifestyle practices. The first model shows Big five Neuroticism as a single predictor, significantly explaining 7% variance (R^2 change = .07) in healthy lifestyle practices [F (1, 421) = 29.72, p < .001]. In the second model, the correlated factors of the Big five personality traits - Agreeableness along with Neuroticism predicted 11% variance (R^2 change = .04) in healthy lifestyle practices [F (2, 420) = 25.81, p < .001]. In the third model, Age was added and along with the personality factors, it predicted 14% variance (R^2 change = .03) in healthy lifestyle practices [F (3, 419) = 21.81, p < .001]. In the fourth model, the fifth post-test of hypertension knowledge in the dimension Causes, care, casualty, and awareness was added; and along with Big five Neuroticism, Agreeableness, and Age it predicted 15% variance (R^2 change = .01) in healthy lifestyle practices [F (4, 418) = 18.97, p < .001]. In the fifth model, the total score of hypertension knowledge assessed in the pre-test was added; and along with Big five Neuroticism, Agreeableness, Age, and the fifth post-test of hypertension knowledge in the dimension Causes, care, casualty, and awareness it predicted 18% variance (R^2 change = .03) in healthy lifestyle practices [F (5, 417) = 18.25, p < .001]. Finally, in the sixth model Achievement motivation was added; and along with Big five Neuroticism, Big five agreeableness, Age, and the fifth post-test of hypertension knowledge in the dimension Causes, care, casualty, and awareness, and the total score of hypertension knowledge assessed in the pre-test it predicted 20% variance (R^2 change = .02) in healthy lifestyle practices [F (6, 416) = 16.99, p < .001]. Hence, the results indicated that five psychosocial factors (i.e., Neuroticism, Agreeableness, Achievement motivation, dimension Causes, care, casualty, and awareness of hypertension knowledge of the fifth post-test, the total score of hypertension knowledge assessed in the pre-test) and one demographic factor (i.e., Age), significantly contributed in predicting healthy lifestyle practices in school children explaining 20% of variance. Out of these, agreeableness dimension of the Big five personality trait,

achievement motivation, improvement in hypertension knowledge of causes, care, casualty, and awareness have positively contributed to the healthy lifestyle practices following the hypertension education intervention, while age, neuroticism and overall pre-test scores of hypertension knowledge have negatively contributed to healthy lifestyle practices following the hypertension education intervention. To explain further, presence of neuroticism, higher age and higher overall knowledge prior to hypertension education intervention were found to be adversely affecting improvement in healthy lifestyle practices following the intervention.

These results explored the objectives of the study and several key points pertaining to this study were highlighted. In perusal of the primary objective of the study it was observed that there was an increase in awareness of hypertension knowledge levels in the children following the hypertension education intervention. The post-tests conducted at various points are testimony to the retention of hypertension knowledge. Significant increase in overall hypertension knowledge was observed after exposure to the hypertension education intervention. Significant difference in hypertension knowledge in the dimensions, namely, General awareness, Lifestyle, Causes, care, casualty, and awareness, and Management of medication was also observed across five post-tests after exposure to the intervention. The analyses helped determine that there was a significant change in healthy lifestyle practice levels after the children were exposed to the hypertension education intervention. The results revealed that early adolescents had better healthy lifestyle practices post intervention. In an attempt to identify the various psychosocial and demographic factors that contribute to hypertension knowledge following hypertension education intervention in school children the findings revealed that the overall hypertension knowledge, the lifestyle dimension of hypertension knowledge, and the management of medication dimension of hypertension knowledge were all significantly predicted by the participants' examination marks and their class (in school) they belonged to. Examination mark and Big five personality trait -

agreeableness were significant predictors of hypertension knowledge in the dimension general awareness, while examination mark and gender were significant predictors of hypertension knowledge in the dimension causes, care, casualty and awareness. When it came to adopting healthy lifestyle practices, the Big five personality traits - neuroticism and agreeableness, achievement motivation, causes, care, casualty and awareness dimension of hypertension knowledge of the fifth post-test, overall hypertension knowledge scores assessed in the pre-test, and age were found to be the predictors. Among them, age, neuroticism, and overall knowledge levels in the pre-test negatively contributed to healthy lifestyle practices.

The significant findings of the study can be summarised into the following points.

1. The hypertension education intervention was found to be effective to the extent of sustainability of knowledge up to three months among the school children
2. Apart from knowledge intervention, several psychosocial factors contributed to the enhanced retention of knowledge in children
3. Two significant predictors for the retention of knowledge were found to be the examination marks and the class the children belonged - both indirectly suggesting the level of cognitive functioning
4. The enhanced knowledge was found to influence the healthy lifestyle practices among the school children indicating the transfer of knowledge to practice
5. The adoption of healthy lifestyle practices post-intervention was found to be relatively high among early adolescents as compared to late adolescents
6. Apart from the knowledge intervention, other psychosocial factors explained the change in the lifestyle practices

7. Translating the knowledge enhancement to practice was found to have the contribution of several psychosocial factors that included cognitive and personality aspects of the children

Chapter V

DISCUSSION

Chapter V

DISCUSSION

The primary objective of the study was to find out the effect of hypertension education intervention on hypertension knowledge levels of school children across the time. The secondary objectives of the study were to examine the differential impact of hypertension education intervention on hypertension knowledge between early and late adolescents, to examine if the hypertension education intervention brings a change in the healthy lifestyle practices in school children, to assess the differential impact of the hypertension education intervention on healthy lifestyle practices between early adolescents and late adolescents, to identify the psychosocial factors that contribute to enhancing hypertension knowledge levels, and to identify the psychosocial factors contributing to healthy lifestyle practices following hypertension education intervention in school children. Based on these objectives five hypotheses were formulated. These hypotheses are discussed with reference to the findings.

Hypothesis 1

Hypertension Education Intervention Will Enhance Hypertension Knowledge Which Will be Retained Over a Period of Time in School Children

Hypothesis 1 stated that the hypertension education intervention will enhance the hypertension knowledge in school children and the knowledge gained will be retained over a period of time. The results revealed significant differences between the pre-test and the post-test on overall hypertension knowledge as well as on all the dimensions of hypertension knowledge. This indicates that education intervention on a serious topic like hypertension has a positive impact on the children studying in class 6 through class 10. The school children are

in a critical stage of cognitive development. The learning during this period is effective (Dahl et al., 2018). The learned contents are remembered better among children than the adults (Király et al., 2017; Sloutsky & Fisher, 2004). Further knowledge inputs on a new topic has the potential to be grasped faster and retained longer among the children due to the factor of curiosity. The actions of children at this age are found to be driven by curiosity and the quest to know. Any knowledge acquired with strong motivation is retained long (Miller et al., 2012; Murty & Dickerson, 2016; Pintrich, 1999). The format of hypertension knowledge intervention was video-based. The instructor was an experienced physician who used interesting visuals and animations through power point presentation. The language and the examples were tested for the suitability for school children. The contents were new, scientific and relevant to one's own life. The animations related to human biology. The examples related to adult hypertension patients who they could relate to members of their own family. The facts related to hypertension condition elaborated more one's own actions either in increasing the risk factors to be affected or the management aspects related to controlling it. Thus, the message was strong on one's own initiatives in keeping the disease at bay or if already affected, managing it effectively while the emphasis was on the seriousness of the condition. When the knowledge imparted can be easily applied to one self or one's loved ones, it is sustained longer (Konstantinou et al., 2021; Leslie et al., 2016; Pickering et al., 2018; Rulison et al., 2015).

The findings also suggest that a video-based health education interventions can be an effective way to teach children about health knowledge, healthy habits and behaviours since they are more engaging than text-based materials and can capture the attention of children and help them to stay focused and interested in the topic (Ampfofo et al., 2020; Djannah et al., 2020; Trent et al., 2010). In the present study the health education intervention successfully established a comprehensive and robust knowledge base which was retained

across time upto 91 days after the first exposure to the intervention, and primarily enhanced children's understanding of hypertension across four key domains. These domains include general awareness about hypertension, lifestyle factors associated with hypertension, causes, care, casualty, and awareness of hypertension, as well as management of medication of hypertension. One key aspect of the successful intervention in this study was the use of repeated exposure to reinforce the knowledge base. These and many other factors must have contributed positively to knowledge gain and retention of the same over a period of 91 days among the participants. Multiple studies have provided clear and convincing evidence that knowledge about hypertension and its complications can be greatly enhanced through relatively simple and cost-effective interventions (Choudhary et al., 2016; Semou & Monteiro, 2022; Yadav & Khokar, 2021).

Furthermore, it was observed that while there was a progressive increase in hypertension knowledge, there was a slight drop in the overall knowledge in the third post-test (35 days after the first exposure to the intervention) and fourth post-test (63 days after the first exposure to the intervention) which picked up again in the final post-test (91 days after the first exposure to the intervention). There are several reasons why the overall knowledge level may have dropped in the third and fourth post-test after the initial exposure to the intervention. One of the reasons could be setting up of monotony in taking the repeated tests (i.e., three tests), since the second exposure to the intervention. The children were engaged in a number of academic tests during this period, because of which there might not have been any scope for active recall activity of the knowledge on this subject. Classical findings such as Ebbinghaus' theory of forgetting (1885) suggests that memory retention decreases over time in the absence of active recall. Thus, the slight drop in knowledge level in the third and fourth post-test may be due to the time elapsed since the second exposure to the intervention. The third reason could be test fatigue. Taking multiple tests can be exhausting, and test

fatigue may have contributed to a drop in knowledge level in the third post-test and fourth post-test. Then, a question may arise as to how there was a pick up in knowledge in the final post-test. This could be for the reason that after the third post-test, further post-tests were spaced better with a gap of four weeks. In such cases challenge replaces the monotony and test fatigue. The drop and a pick up in the knowledge levels also conforms with the phenomenon of spontaneous recovery discussed by Pavlov (1927). Besides all these, the repeated tests must have worked as repeated active recall for the children, resulting in higher knowledge retention.

Based on the results and the reasons discussed above, the hypothesis that hypertension education intervention will enhance hypertension knowledge which will be retained over a period of time in school children is accepted. .

Hypothesis 2

Hypertension Education Intervention Will Have a Differential Impact on Hypertension Knowledge Between Early Adolescents and Late Adolescents

Hypothesis 2 of the study which stated that the hypertension education intervention would have a differential impact on hypertension knowledge between early adolescents (ages 10-14) and late adolescents (ages 15-17) was not supported by the results of the study. The study found no significant differences in the impact of the intervention on hypertension knowledge between the two age groups. Several factors may have contributed to the lack of differential impact between early and late adolescents. One possible explanation is that both age groups were equally receptive to the intervention, and both were able to benefit from the information provided. This is supported by previous research which has found that both early and late adolescents are capable of understanding and retaining health information when it is presented in an age-appropriate manner (Tan et al., 2012). Another possible explanation is

that the intervention was equally effective for both age groups because it focused on core concepts and did not rely on complex medical terminology or detailed explanations. The intervention used clear and simple language, which can be easily understood by both age groups. The novelty of the topic, its relevance to the real life, its connection to human biology which is part of the curriculum right from class 6, the human- interest factor of details related to the lifestyle are equally important for both early and late adolescent groups. These factors must have been responsible in casting same influence on both the groups.

In view of the above findings and the explanation given above, the hypothesis that the hypertension education intervention would have a differential impact on hypertension knowledge between early adolescents and late adolescents is rejected.

Hypothesis 3

Following Hypertension Education Intervention, Psychosocial Factors Will Positively Contribute to Enhancing the Hypertension Knowledge Levels in School Children

Hypothesis 3 of the study stated that in addition to hypertension education intervention, certain psychosocial factors positively contribute to enhancing the hypertension knowledge levels in school children. The results of five multiple regression analyses identified certain psychosocial factors contributing to overall knowledge levels as well as its dimensions. These psychosocial factors are the agreeableness personality component of Big five personality test, examination mark, academic class, and gender.

Agreeableness dimension of personality was found to have significantly contributed to the general awareness component of hypertension knowledge. General awareness component consisted of items that related to the basic aspects such as the concept of hypertension, the standard norm of systolic and diastolic readings, and so forth, which

describe the broad awareness about the disease. Knowledge in this concept calls for a rote learning and memory. In terms of Bloom's taxonomy such knowledge involves remembering basic facts, memorising basic terminologies and concepts where deep understanding of them is not necessary (Bloom et al., 1956).

The personality trait of Agreeableness has been found to play a role in knowledge acquisition, retention, and transfer. In a study by Komarraju et al. (2011), the Big five personality trait – agreeableness along with conscientiousness was found to be positively correlated with four learning styles – methodical study, elaborative processing, synthesis analysis, and fact retention. They may have been more receptive to the education intervention because they are more open to learning and more motivated to help others, including themselves. Such knowledge enhancement results from repetition of the learned material either through memorising or through mentioning them in frequent interactions with others. The traits of cooperative, empathetic, and compassionate related to agreeableness can facilitate the learning process by promoting positive interactions with others and encouraging a collaborative approach to learning. For example, individuals high in agreeableness may be more likely to seek out help from others, provide assistance to their peers, and participate in group discussions, all of which can enhance their learning. After acquiring knowledge on hypertension these children might have involved in discussion on the subject with other which in turn might have strengthened their knowledge level. The school children with high in agreeableness may be inclined to help their peers and contribute to group discussions, which facilitated knowledge exchange and transfer. Additionally, they may have been more likely to engage in cooperative and collaborative activities during the intervention, which could have facilitated the learning process. The personality dimension of Agreeableness is one of the Big five personality traits that describe an individual's personality. Agreeableness refers to the tendency to be cooperative, empathetic, and compassionate towards others.

Agreeable individuals are often cooperative in nature, trustworthy, and helpful, which increases their likelihood of meeting deadlines. Regarding knowledge transfer, individuals high in agreeableness are also more likely to transfer their health knowledge. Previous studies had found that people with high agreeableness never feel hesitant to share their information (Gupta, 2008; Matzler, 2008; Opesade & Alade, 2021). Further, their cooperative and empathetic nature must have aided in promoting a deeper level of engagement with the material, leading to more durable learning.

Overall, this finding suggests that Agreeableness dimension of personality can play an important role in knowledge acquisition and retention, particularly when the knowledge component relates to general awareness calling for remembering terminologies, concepts and facts.

The second component that significantly contributed to knowledge enhancement in all the dimensions was examination mark of the school children. This contributed to improved overall hypertension knowledge as well as all the four dimensions of hypertension knowledge following hypertension education intervention. It is evident that students who perform well academically tend to possess strong cognitive abilities, exhibit high levels of motivation, and employ effective learning strategies (Leeson et al., 2008; Lüftenegger et al., 2015; Samperio, 2019). These qualities are conducive to attaining, retaining and recalling knowledge which results in good academic performance and attaining good marks in the examinations. The school examination mainly is a test of memory. Knowledge is the first step of Bloom's taxonomy that involves memory and not necessarily understanding comprehension, application, analysis, synthesis and evaluation. For a moment, we may assume that the hypertension knowledge test is only an assessment of the memory of facts presented to the children. In that case, students who have the ability to learn, retain and remember the facts well and reflect this ability in their performance in the examinations are the ones who gained

relatively more through the hypertension knowledge intervention. They are found to be those who could retain the knowledge well for a longer period. Having said that, it should be noted that academic marks also contributed to the other dimensions of hypertension knowledge such as lifestyle management, causes, care, casualty, and awareness, and medication management which require cognitive levels beyond remembering the facts. These knowledge inputs involve understanding, comprehension, application analysis, synthesis and evaluation. In order to retain such knowledge the child will have to comprehend the phenomenon well. For example, in order to acquire the knowledge about the normal circulatory system and the disruptions and anomalies in hypertension condition, the child needs to visualise the two contrasting cardiovascular systems - one in normal human being and the other in a hypertensive person with atherosclerosis, adipose deposits, increased volume of fluids, heart's pumping function, and so forth. Then, to understand the symptoms of hypertension the child needs to apply the knowledge to a known hypertensive person in the close social network or family. A deeper analysis enables the child to relate the link the condition to a known adverse event among a family member, a relative or a person in one's vicinity. Further, the knowledge about the aetiology, symptoms, lifestyle, diet, exercise, medication and health risk behaviour, and so forth, which was included in the intervention will have to be put together by the child in order to have a comprehensive knowledge about the whole concept of hypertension. This is very similar to the academic curriculum. The school curriculum weaves into it certain facts to be remembered, concepts to be understood and comprehended, knowledge and skills gained to be applied, analysed, synthesised and evaluated. Those students who have these cognitive abilities are the ones who perform well in the examination. The contents in the hypertension education intervention were so constituted to invoke all these cognitive abilities in the children. Therefore, those who are good in these

cognitive abilities who score high marks in the examination also scored high in this knowledge retention.

The third component that contributed significantly to sustenance of hypertension knowledge was the academic class in which the children studied. This factor contributed significantly to overall knowledge retention and two dimensions, namely, lifestyle and management of medication. The science curriculum in school is so designed to add knowledge along the hierarchy of classes. Thus, the students from higher classes have opportunity to more exposure to subjects related to biological sciences. Further, while the lower classes have just introduction to health related topics, the higher classes go into the depths of the same topics as they progress in their classes. This functions as a definite repetition and overlearning. This prior knowledge and experience may have enabled them to more easily integrate new information and connect it to their existing schema. They may also have had more exposure to health-related curriculum content, including topics related to hypertension, lifestyle modifications, and medication management. This may have provided them with a foundation of knowledge that could be built upon during the hypertension education intervention. Apart from this, the students in various stages of their cognitive development have differential cognitive abilities (Piaget, 1936). Thus, it is not surprising that higher classes manifested higher cognitive retention in overall knowledge and the two dimensions. It is of significance here to particularly discuss about the contribution of academic class to the two dimensions, namely, lifestyle and management of medication. Knowledge related to lifestyle changes requires higher level of cognition like synthesis. The knowledge connects the physiology of cardiovascular system to human behaviour. It may be difficult for the children of lower classes to comprehend the relationship because they may still be in a transitional stage from concrete operational to formal operational stage. The knowledge connecting the physiological operations to behavioural antecedents involves some

abstraction, logical reasoning and visualisation. The children from the higher classes who are into formal operation are more comfortable in assimilating this knowledge (Piaget, 1936). This could be one reason that explains the findings.

Academic class was also found to contribute to another dimension of hypertension knowledge, namely, management of medication. So far as the lower classes are concerned, the connection between illness and medicine among younger children is one of simple cause and effect relationship (Hämeen-Anttila & Bush, 2008). Younger children normally have experiences of simple illnesses such as fever, gastroenteric problems, common cold pains and aches, they are treated with medicines and recover. They are never explained about the way the medicines work on their system. For them medicine at best is construed as an antecedent where recovery is the desired outcome. The function of the chemical compounds in the system to correct a dysfunction is an abstract knowledge for the younger age group which is a challenging information to be assimilated and accommodated by the older age group. This helps in changing the schema of treatment in the children belonging to higher classes. A changed schema with a new knowledge input has the potential to be sustained (Seel, 2012). This could be the explanation for the contribution of academic class to the knowledge dimension of medication management.

Furthermore, gender significantly contributed to improved hypertension knowledge in the dimension causes, care, casualty, and awareness. The finding that female school-going children significantly contributed to improved knowledge and retention after the hypertension education intervention could be attributed to cultural and social factors such as Gender socialization (Stockard, 2006). In certain societies, girls are encouraged to be more committed, compliant, attentive, and disciplined than boys. There are also higher expectations of performance from the girls at school levels. There have been a large number of studies which established the higher performance of girls in school level compared to boys

where knowledge is the yardstick. This could result in female students being more attentive during the knowledge intervention sessions. Consequently, could have sustained the knowledge better than the boys.

Based on the above findings and explanations provided the hypothesis that psychosocial factors will positively contribute to enhancing the hypertension knowledge levels in school children is accepted and the psychosocial factors are agreeableness dimension of the Big five personality trait, examination mark, academic class, and gender.

Hypothesis 4

Hypertension Knowledge Will Bring a Positive Change in Healthy Lifestyle Practices Among School children

Hypothesis 4 conjectured that hypertension knowledge will bring a positive change in healthy lifestyle practices among school children. The results revealed a significant positive change in the healthy lifestyle practices in school children following the hypertension education intervention. It may be relevant to mention here that the children were not explicitly instructed to adopt healthy lifestyle practices. They were only tested on healthy lifestyle practices before and after the hypertension education intervention. If there was any significant change in their healthy lifestyle practices, it could be because of their translation of knowledge into practice. There is a growing body of research that supports the relationship between health knowledge and healthy lifestyle practices among school children (Grosso et al., 2013; Harrell et al., 2005; Jovanović et al., 2023; Sabingoz & Dogan, 2019; Tsartsali et al., 2009). In consistence with the result of the present study, these studies also suggested that interventions aimed at improving health knowledge among school children can have a positive impact on their healthy lifestyle practices. Specifically, providing education about hypertension and its associated risk factors may lead to changes in behaviours such as

increased physical activity, improved diet, and better management of stress. When individuals are more cognizant of the long-term consequences of unhealthy behaviours, they may be more motivated to adopt healthier lifestyles. This could lead to improvements in overall health outcomes, including lower rates of obesity, hypertension, and other chronic diseases (Balas & Boren, 2000; Bonaccio et al., 2013; Geany et al., 2015; Wang et al., 2003). Hence, improving health knowledge can be an effective strategy for adopting healthy lifestyle practices. The intervention in this study has increased the awareness of school children about the importance of healthy lifestyle practices in the management of hypertension. By educating the children about the risk factors associated with hypertension, such as an unhealthy diet, inadequate physical activity, and the vulnerability to other diseases resulting from hypertension, the intervention seems to have motivated them to adopt healthier habits. The hypertension education intervention have also taught them about the benefits of regular exercise, and provided them with guidance on how to incorporate physical activity into their daily routine. By providing the children with the knowledge necessary to make healthy choices for better management of hypertension, the intervention seems to have had a lasting impact on their overall healthy lifestyle practices.

The relationship between cognition and behaviour is supported by several models and theories (Ajzen, 1991; Bandura, 1986; Fisher & Fisher, 1992; Rosenstock, 1974). A strong cognitive foundation through knowledge intervention is important in strengthening a belief or conviction about a process or action (Diddana et al., 2018). In case the existing action is not in congruence with the newly developed belief or conviction, there is a disequilibrium in the individual. This in turn gives rise to a cognitive dissonance (Festinger, 1957). With this dissonance in operation, there should either be a change in the belief or behaviour. The change in belief is less probable when the knowledge intervention was intense and the cognitive base is strong. In such cases, the opportunity to resolve the disequilibrium is change

in behaviour. Under normal circumstances, any behavioural change encounters stiff resistance to change. However, when the knowledge intervention incorporates the feasibility of change by citing the personal control and self-efficacy factors in improving the behaviour, the resistance factor gets weakened (Khumros et al., 2018; Rolling & Hong, 2016). Further, this change becomes easier when the intervention is given at an impressionable age. Adolescence is one such critical and impressionable age when the child is concerned about one's health status and its outcomes. This could be one of the reasons for the impact of knowledge intervention manifesting itself in healthy lifestyle changes showing a significant positive change post-intervention. Though the goal of the intervention was to bring in health behavioural changes, it was deliberately not integrated into the intervention package so that the natural and interrelationship between cognition and behaviour is captured by the study.

It is evident that the knowledge gained through hypertension education intervention did not confine itself to the cognitive level but translated into action. Behavioural changes will be transient if they are based on coercion or enforcement. On the other hand, if behaviour changes originate from the belief evolved from a strong cognitive foundation sustain longer and turn into habits (Khumros, 2018). This is possible when the knowledge base advocating the change behaviour is robust, with its comprehensibility, applicability, reliability and scientific evidence. Well structured knowledge package suitable for the target group invoking curiosity, triggering further enquiry into the facts through verification, having application value and relevant to one's life has the strength to provide a good cognitive structure. This cognitive structure may refine the existing schema which may finally develop into a strong conviction. The conviction about an issue strengthens the motivation to initiate action. The motivation will translate to action only if the self-efficacy is high. In this study, the hypertension education had ingredients to enhance self-efficacy as an integral component. The target group was oriented sufficiently to the role of self in controlling the blood pressure

through lifestyle modifications. This is likely to operate as a strong input to enhance one's self-efficacy. Further, the inputs on the consequences of health risk factors have the possibility of eliciting an element of fear resulting from the perception of the seriousness of the disease condition. All these segments of knowledge inputs could have worked in combination. As a result, the children must have viewed the disease as something to be taken into serious cognizance, got encouraged by the ease with which preventive steps could be taken. At a young age, it is unlikely to have barriers to adopt a healthy lifestyle practices, which in fact would have positive reinforcement from parents and significant others. Thus, viewing the benefits from the healthy lifestyle, not seeing any serious barriers to new healthy lifestyle in the face of high self-efficacy and control over the situation, the children could easily translate the cognition out of hypertension education intervention into healthy lifestyle practices. This entire phenomenon fits into the health behavioural theory of Health Belief Model (Rosenstock, 1974). The model postulates that cognition or belief about the health is at the base. Behavioural change originates from belief. The individual's perception of seriousness of the condition, one's relevance to the condition (i.e., perception of one's susceptibility), constitute the bottom of the model. Above this comes one's assessment of control over the situation, the ability to control the situations to initiate the change in health behaviour. One perceives the barriers to reach the set health goal vis-a vis the benefits of the new behaviour. When one has positive cues to such changed behaviour, it is highly probable that the desirable healthy behaviour is initiated, adopted and sustained. There are a number of studies on various populations that supported the Health belief Model (Khani et al., 2015; Khorsandi et al., 2017; Jeihooni et al., 2019; Naghashpour et al., 2014; Tola et al., 2016).

This study confirmed the Health Belief Model to the extent of the success of cognitive health intervention in resulting in the subsequent health behaviour. However, the sustainability of such change in healthy lifestyle needs to be tested preferably through

longitudinal studies. What positively contributed to the lifestyle changes apart from the knowledge intervention are agreeableness of the Big five personality traits, achievement motivation, and improvement in hypertension knowledge of causes, care, casualty, and awareness; while age, neuroticism, and previous knowledge about hypertension have negatively contributed. This is understandable because a neurotic personality and a strong misconception or misinformation are likely to constitute as restraining forces for behaviour change.

Based on the findings above and the logical reasoning provided, the hypothesis that following hypertension education intervention there will be a positive change in the healthy lifestyle practices in school children is accepted.

Hypothesis 5

Hypertension Education Intervention Will Have a Differential Impact on Healthy Lifestyle Practices Between Early Adolescents and Late Adolescents

The results further gave an insight that the positive change in healthy lifestyle between pre and post knowledge intervention among the early adolescents was significantly higher than that of late adolescents. The findings indicate that early adolescence stage is more impressionable and suggestible for behavioural change through knowledge interventions compared to the late adolescence. The differential impact of hypertension education intervention on healthy lifestyle practices between early and late adolescents could be due to a variety of factors. One possible explanation is that early adolescents in this study were more receptive to health education interventions due to the developmental changes that occur during this period. In consistence with the result of the present study, studies has found that school-based health education programs are more effective in improving healthy lifestyle behaviours among early adolescents compared to older adolescents (Hoying et al., 2016;

Wang et al., 2018). Early adolescents may be more open to new information and ideas, which could make them more likely to adopt healthy behaviours as a result of the intervention. Another possible explanation is that early adolescents in this study may have less established unhealthy habits compared to late adolescents, making them more likely to adopt healthy behaviours in response to the intervention. Late adolescents, on the other hand, may have more entrenched unhealthy habits and attitudes, which could make it more challenging to change their behaviours even with education and intervention. It is also possible that the differential impact is due to differences in the delivery of the intervention, such as the specific content that was covered. For example, the intervention may have been more engaging or relevant to early adolescents, or it may have addressed specific barriers to healthy behaviour that were more relevant to this age group. Late adolescence is a stage where the children are influenced more by the peer groups while early adolescence is a stage where authority figure gains more attention and significance (Carlo et al., 2007; Lapsley et al., 1984; Smith et al., 2014). Acceptance and compliance with the rules, norms and social expectations are significantly higher during early adolescence when the children are more dependent on adults (Coleman & Coleman, 1984; Hendry et al., 1992; Lapsley et al., 1984). In late adolescence, where the transition to adulthood is more pronounced in physiological and physical changes, the transition in behaviour in terms of having a casual perspective to serious matters, attempts to gain peer acceptance through non-compliance or deviation of norms, trying to prove oneself to be an adult by questioning the facts is a common phenomenon. Hence the finding that the early adolescent group showed a significantly higher healthy lifestyle changes post knowledge intervention is understandable from the perspective of developmental stages.

In view of the findings and the supportive explanation elaborated above the hypothesis that stated that hypertension education intervention will have a differential impact on healthy lifestyle practices between early adolescents and late adolescents is accepted.

Implications

The study has proved that education intervention on health is effective for school children. They are able to construct a cognitive structure out of it. With the repeated exposure, novel and interesting approach using the authority in the area of subject, children are able to sustain the knowledge. Further they are able to adopt healthy lifestyle behaviour based on the intervention. This provides a feeder to the national health policy that health education should start at an early age. The intervention should not only focus on the content but also the approach to it should be innovative to suit the interest of the age group. Further the study provides a significant policy input that the statistical projections about the incidence and prevalence of any disease should cross the barriers of mere academic interest and constitute an appropriate thinktank to handle those situations and arrest the profression of prevalence. For that, the appropriate young age groups should be targeted for timely interventions. For example, the findings of this study is relevant to the projections that state that by 2030 the prevalence of hypertension will reach 44% in the Indian population which contradicts WHO's prediction of a 25% decrease in hypertension prevalence in the same year (Gupta et al., 2018). Considering that the prevalence of hypertension among the young children between 5 and 15 years of age is now a matter of concern in India (Das et al., 2017; Narang et al., 2018), and also in view of the fact that the youth are found to be the vulnerable group for cardiac episodes post COVID scenario, the projections of hypertension for the upcoming years cannot be viewed casually or academically. The children in the age group of 10 to 17 years will reach the vulnerable age in the near future. Unless they are educated and given a sound cognitive base about hypertension and the self-efficacy in managing lifestyle

from now onwards as a preventive measure, they may not bother to inculcate healthy lifestyle. This in turn will prove the projections for the future. If the projections come true, it would impact the national health and national economy in a severe way because the vulnerable group is also in their optimum productive age group. Hence, in order to protect the people from such avoidable exigencies, introduction of topics related to non-communicable diseases, and progressively enhancing the complexity of information on this through the curriculum in biological sciences, imparting such knowledge through innovative means, using media to create health literacy are some cost effective measures that ensures national health and national economy.

Limitations

The study, though a great value addition to the field of knowledge has some limitations. First of all, a longitudinal study on such topic would be more scientific and reliable. Due to paucity of time the follow up was limited to three months. It would have been interesting to see if the healthy lifestyle changes are sustained longer and if they are converted into habits over a decade. This could not be taken up for the reasons of feasibility in view of time constraints. Secondly, the sample was limited to the classes from 6^{th} to 10^{th}. Inclusion of students from class 1 to graduation would have given an insight on the most effective phase for such intervention. These two aspects can be taken up for further research in the field. In spite of these two limitations, the findings of this study that the hypertension education intervention to school children has the potential to bring positive change in the healthy lifestyle is certainly a value addition to the field of Behavioural Cardiology. Further, the conformation of the results to the theoretical framework of Health Belief Model adds validity to the study.

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APPENDICES

APPENDIX A1

Hypertension Knowledge Test (HKT)

Name: **Class:** **Gender:**

Instructions: This test is designed to know what you understand about hypertension and its management. Read each item below and circle the option that you think is correct. If you do not know the answer then circle the option 'Do not Know'.

1. If someone's blood pressure is 120/80, it is

   a. High
   b. Low
   c. Normal,
   d. Pre-Hypertension
   e. Do not know

2. Dietary changes that are useful to control hypertension

   a. Consuming more fruits, vegetables and whole grains
   b. Red meat, egg, milk, cheese
   c. Confining to liquid diet.
   d. Go on fasting intermittently
   e. Do not know

3. For patients with high B.P, reducing salt intake.

   a. Helps in bringing down the B.P
   b. Increases the B.P
   c. Does not have any impact
   d. Is dangerous
   e. Do not know

4. Once someone has high blood pressure, it usually lasts for

   a. Two years
   b. 5-10 years.
   c. 10-15 years.
   d. Rest of their life.

e. Do not know

5. People with high blood pressure should take their medicine

a. Every day and lifelong without break.
b. A course for one week.
c. Only when the B.P is high.
d. Until the B.P gives normal reading.
e. Do not know

6. What happens when B.P shoots up very high crossing its limits

a. Leads to paralysis
b. Leads to holes in the heart
c. Damages the bones
d. Both a & b
e. Do not know

7. Doctor needs to be informed about the medicines that a B.P patient is using

a. When undergoing surgical procedures
b. When going for X-Ray
c. When consulting doctor for uncontrolled fever
d. When one has severe throat infection
e. Do not know

8. Which of the following is not a cause of high B.P?

a. Obesity
b. Excessive anger
c. Smoking
d. Hereditary.
e. Do not know

9. The fact about High blood pressure is that

a. It is normal phenomenon in every person.
b. It causes serious health problems if left untreated.
c. It is seen only in old people
d. It is seen in people who are short tempered
e. Do not know

10. Risk of hypertension can be reduced by

a. Smoking occasionally
b. Consuming limited quantity of alcohol everyday
c. Avoiding physical activity
d. Reducing the weight
e. Do not know

11. Medicines for hypertension

a. Can be suggested by a relative who has been taking medicines for high B.P for prolonged period
b. Cannot deviate from the prescribed medication under any circumstance.
c. For any reason, if the prescribed medicine is unavailable, the medicines used by other hypertensive patients can be taken temporarily.
d. When one forgets to carry the medicine while going out, it can be skipped.
e. Do not know

12. In a patient of Hypertension, If suddenly one side of face starts drooping, speech becomes difficult, arm becomes weak then its possibly

a. Brain stroke
b. Heart attack
c. Heart failure
d. Kidney failure
e. Do not know

13. Commonly used drugs to treat hypertension

a. Beta blockers and diuretics
b. Diuretics and hormones
c. Vasodilators and steroids
d. Sodium carbide and calcium carbonate
e. Do not know

14. Which one of the following is wrong

a. Medications should be taken on time every day.
b. When the B.P is normal, medication can be stopped.
c. Take the medicine irrespective of other problems like fever or cold.
d. Doctor should know all the medications being taken.
e. Do not know

15. What should be done if a person misses a dose of medication?

    a. It is good to take skipped dose along with the next dose together
    b. Skip the next dose also and start fresh from next day morning
    c. Take the dose as early as possible.
    d. It is good to skip routinely to avoid over dosage
    e. Do not know

16. Warning signal during a heart attack

    a. Person suffers from fever & chills
    b. Person experiences headache.
    c. Person suffers from dizziness, pain in the chest and shortness of breath.
    d. Person suffers from swelling of feet
    e. Do not know

17. Which of the following is correct?

    a. Decrease medication dosage when the symptoms disappear
    b. Medication can be skipped once in a way
    c. Have a routine for taking medication
    d. Increase the dosage when the symptoms are severe.
    e. Do not know

18. Hypertension is blood pressure recording more than

    a. 100/80
    b. 110/70
    c. 120/80
    d. 140/90
    e. Do not know

19. Life style modifications for treating Hypertension include

    a. Resting a lot
    b. Regulating diet and exercise
    c. Living in quiet locality
    d. Controlling anger.
    e. Do not know

20. Which of the following statement is wrong?

    a. Eat less red meat and sweets
    b. Eat foods that are high in magnesium, potassium, and calcium

c. Eat foods with more sodium
d. Eat more whole grain products and fish
e. Do not know

21. Damage caused by high blood pressure to body

a. Heart attack, heart failure, brain stroke.
b. Damage of blood vessels, eyes, kidneys.
c. Gaining lot of weight
d. Both A and B are true
e. Do not know

22. All are true statements about Hypertension except

a. Genes,obesity,stress are some of risk factors
b. Walking long distances is harmful for patients with high B.P.
c. Headaches,chest pain, breathing difficulty can be symptoms when B.P. is high
d. It can sometimes be a “silent killer” with very little symptoms
e. Do not know

APPENDIX A2

Healthy Lifestyle Practice Scale for Children and Adolescents (HELIPSCA)

We all follow certain practices in our life. This includes certain habits related to eating, sleeping, playing, studying etc. This scale consists of a few such practices in the life of children like you. Out of these there are a few we do almost daily (Always almost). Few others though not daily, we tend to do very often (Frequently). Some of the activities we do once in a way (Rarely). There may be some which we don't do at all (Never). Read all the items carefully. Think of yourself doing that activity and in case you do it daily, tick in the column "Almost always". Depending upon how often or rarely you do the activities, you have to tick in the column "Almost always", "Frequently", "Rarely" or "Never". For example; If there is a statement such as "going to the library" in the list, you need to see how often you go to the library. If you go to the library everyday you must tick in the column "Almost always". In case you don't go to the library everyday but go 3 to 4 times in a week, you should tick in the column "Frequently". In case, you go to the library once a month or so, you should tick in the column "Rarely". On the other hand, if you don't go to the library at all, you should tick in the column "Never".

There are no right or wrong answers in this. Whatever is true in your case is the correct answer for you. What maybe correct for you may not be correct for your friend. Therefore, please answer honestly about yourself.

S.No	STATEMENTS	Almost always	Frequently	Rarely	Never
1.	Eat Chocolates				
2.	Play video games for long hours				
3.	Go out and play in the playground/park/open area				

S.No	STATEMENTS	Almost always	Frequently	Rarely	Never
4	Do activities such as cycling, skating, swimming etc.				
5	Stay awake beyond sleeping time				
6	Sleep during day time				
7	Skip a meal (breakfast/lunch/dinner)				
8	Eat food from outside (such as pizza, burger, momo, noodles, samosa or any deep fried snacks)				
9	Eat street food (such as pani puri or any snacks sold on the roadside)				
10	Laugh a lot				
11	Cry a lot				
12	Skip brushing my teeth				
13	Skip bathing				
14	Eat vegetables				
15	Eat fruits				
16	Share personal problems with others				
17	Get angry				
18	Listen to music				
19	Participate in prayers (group prayers in religious places)				
20	Do not wake up on time in the morning				
21	Drink aerated cold drinks (pepsi, coke, lime etc)				
22	Drink adequate water				
23	Tried certain activities for fun (smoking, chewing tobacco)				
24	Continue to stay in the place when someone is smoking				
25	Spent long hours in front of the computer/t. v				

S.No	STATEMENTS	Almost always	Frequently	Rarely	Never
26	Refused to eat things I do not like though they are nutritious				
27	Over eat				
28	Skip drinking milk				

APPENDIX A3

Big Five Questionnaire – Children (BFQ-C)

Instructions This scale has 65 statements of different ways you possibly behave, feel or do things in your daily life. Please read each statement carefully and think how frequently you do/ feel/ behave that way. There are five options in the five columns indicating how frequently one behaves on the way described in the statement. Choose the appropriate column depending on how frequently you think it happens to you.

For example, if the statement is *"I feel irritated I cannot complete my homework."* In case it happens to almost every day, you must tick( ) in the last column 'Almost Always'. In case it happens about twice a week you must tick in the column 'Often'. If it happens to you once a month or so, you must tick in the column 'Rarely'. If it happens to you only once in a while, you must tick in the column 'Rarely'. In case this never happens to you, then you should tick in the column 'Almost Never'.

There is no right or wrong answers in this. Every child's experience is different. Hence whatever is the experience in your case is the right answer for you. Hence, please answer honestly.

S.No	STATEMENTS	Almost Never	Rarely	Sometimes	Often	Almost Always
1	I like to meet with other people					
2	I share my things with other people					
3	I do my job without carelessness and inattention					
4	I get nervous for silly things					
5	I know many things					
6	I am in a bad mood					
7	I work hard and with pleasure					

S.No	STATEMENTS	Almost Never	Rarely	Sometimes	Often	Almost Always
8	I argue with others with excitement					
9	I like to compete with others					
10	I have a great deal of fantasy					
11	I behave correctly and honestly with others					
12	I easily learn what I study at school					
13	I understand when others need my help					
14	I like to move and to do a great deal of activity					
15	I easily get angry					
16	I like to give gifts					
17	I quarrel with others					
18	When the teacher asks questions I am able to answer correctly					
19	I like to be with others					
20	I engage myself in the things I do					
21	If someone commits an injustice to me, I forgive her/him					
22	During class-time I am concentrated on the things I do					
23	I can easily say to others what I think					
24	I like to read books					
25	When I finish my homework, I check it many times to see if I did it correctly					
26	I say what I think					
27	I treat my peers with affection					
28	I respect the rules and the order					
29	I easily get offended					
30	When the teacher explains something I understand immediately					
31	I am sad					
32	I behave with others with great kindness					
33	I like scientific TV shows					
34	If I take an engagement I keep it					

S.No	STATEMENTS	Almost Never	Rarely	Sometimes	Often	Almost Always
35	I do something not to get bored					
36	I like to watch TV news, and to know what happens in the world					
37	My room is in order					
38	I am polite when I talk with others					
39	If I want to do something, I am not capable of waiting and I have to do it immediately					
40	I like to talk with others					
41	I am not patient					
42	I am able to convince someone of what I think					
43	I am able to create new games and entertainments					
44	When I start to do something I have to finish it at all costs					
45	If a classmate has some difficulty I help her/him					
46	I am able to solve mathematics problems					
47	I trust in others					
48	I like to keep all my school things in a great order					
49	I easily lose my calm					
50	When I speak, the others listen to me and do what I say					
51	I treat kindly also persons who I dislike					
52	I like to know and to learn new things					
53	I play only when I finished my homework					
54	I do things with agitation					
55	I like to joke					
56	It is unlikely that I divert my attention					
57	I easily make friends					
58	I weep					
59	I would like very much to travel and to know the habits of other countries					
60	I think other people are good and honest					

S.No	STATEMENTS	Almost Never	Rarely	Sometimes	Often	Almost Always
61	I worry about silly things					
62	I understand immediately					
63	I am happy and lively					
64	I let other people use my things					
65	I do my own duty					

APPENDIX A4

Achievement Motivation Inventory (AMI)

Instructions: This scale has 32 statements related to how you feel/ do/ behave in daily life. All statements may not fit you 100%. While some may be a very correct description of you, the others may somewhat resemble you while yet others may be not at all like you. Please read each statement carefully. Think of the description in relation to you and tick mark in only one appropriate column.

For example, if the description is - *"I like to be the best student in my class"* and you fully agree with the description, tick in the first column indicating 'Completely agree'. If the statement describes you correctly for most times but not always, then tick in the second column 'Mostly agree'. If the statement description of you is correct in very few or rare occasions, then tick in the third column 'Agree to some extent'. If the statement's description of you is unfit for most occasions, tick 'Mostly Disagree' column. If you don't agree with the description at all, then tick 'Completely disagree' column.

Each child has different experiences; hence what you agree with may be different from your friend's agreement. Remember to answer honestly as that there are no right or wrong answers.

S.No	STATEMENTS	Completely Agree	Mostly Agree	Agree to some extend	Mostly Disagree	Completely Disagree
1	I feel I am a lazy person					
2	Days often go by without me having done a thing					
3	I like reading the biography of great people in order to learn how they overcome hurdles and achieved great things in life					

S.No	STATEMENTS	Completely Agree	Mostly Agree	Agree to some extend	Mostly Disagree	Completely Disagree
4	I plan ahead what subjects to study during my free time					
5	When I come to know that somebody like me, have achieved something great, I am motivated to do the something in a better way					
6	Most people who know me say that I am hard working and ambitious					
7	I go on postponing what I should be studying to day					
8	I take a lot of time to get started to the task of study					
9	Most evenings I kick back and relax rather than prepare for the next day's school work					
10	Sometimes, I forget to do my homework					
11	I never leave a task/assignment I start, unfinished					
12	I enjoy working with people who score at my level or lower, rather than with those who are smarter and more hardworking than me					
13	I dislike failing in my school examinations due to unpreparedness					
14	I always work very hard to be among the best students in my school					
15	I find myself just taking life as it comes without planning					
16	I aim at reaching the highest level in Education					
17	When I grow up, I want to do something which others have not done					
18	I am basically a competitive person and I compete just for the sake of competing					
19	I believe that success in life has less to do with hard work and more to do with luck and being in the right place at the right time					
20	I enjoy reading all kinds of books including those that are not part of our school syllabus					

S.No	STATEMENTS	Completely Agree	Mostly Agree	Agree to some extend	Mostly Disagree	Completely Disagree
21	I shall be satisfied with an above average performance, even though it may not be my best					
22	I prefer to use my time for doing something else rather than trying to perfect something that I have already completed					
23	I enjoy spending most of my time alone concentrating on my school work					
24	I always try to standout from the rest of my class in one way or the other					
25	I will go ahead with my plans only if I am sure that other people will approve of it					
26	I get restless and annoyed when I feel I am wasting time					
27	It is not a good idea to be always above others in achievement, because that may make them feel bad about themselves					
28	I like to be the best student in my class					
29	I enjoy finishing my school assignments even when they are difficult and time consuming					
30	I enjoy making friends with the most intelligent student in my class so as to keep up my standards of performances					
31	I like when people say in front of others that I am doing well in school					
32	I would like to deal with difficult situations, so that the blame or praise for its results come to me alone					

APPENDIX B1

UNIVERSITY OF HYDERABAD

INSTITUTIONAL ETHICS COMMITTEE DECISION LETTER

IEC No. **Application No:**	UH/IEC/2021/176	**Date of review**	21-12-2021
Project Title:	Impact of hypertension education on health cognition and behaviour in school children		
Principal Investigator/ Co-PI:	PI: Teisovinuo Semou		
Participating Institutes if any	----	Approval from Participating Institute	----
Documents received and reviewed	Protocol & ICF		
In case of renewal submission of update	----		
Decision of the IEC:	Approved Duration: One year from date of approval		
Any other Comments Requirements for conditional Approval	----		
Members Present	Dr. A.S. Sreedhar, Dr. M. Srinivas, Prof. B. R. Shamanna, Dr. M. Varalakshmi, Sri. A. Madhava Rao, Dr. Stalin Choudary, Prof. Pingali Sailaja, Dr. M. K. Aruansree and Dr. Deepa Srinivas		

Please note:

a. Any amendments in the protocol must be informed to the Ethics committee and fresh approval taken.
b. Any serious adverse event must be reported to the Ethics Committee within 48 hours in writing (mentioning the protocol No. or the study ID)
c. Any advertisement placed in the newspapers, magazines must be submitted for approval.
d. If the conduct of the study is to be continued beyond the approved period, an application for the same must be forwarded to the Ethics Committee.
e. It is hereby confirmed that neither you nor any of the members of the study team participated in the decision making/voting procedures and declared conflict of interest.

A S Sreedhar 21/12/21

Chairman

(Dr. A S Sreedhar)

21/12/21

Member Secretary

(Prof. B. R. Shamanna)

21/12/2021

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APPENDIX B2

UNIVERSITY OF HYDERABAD
SCHOOL OF MEDICAL SCIENCES
CENTRE FOR HEALTH PSYCHOLOGY

F. No. UH/CHP/2022 Date:

To

_____
_____
_____
_____

Sub: Permission for data collection-regarding

Madam/Sir,

Teisovinuo Semou is a research scholar at Centre for Health Psychology, University of Hyderabad and is conducting her PhD research work with title "Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children" under my supervision. As part of her research work she is imparting hypertension education to the school children through cognitive intervention. As a part of this, she has to give cognitive intervention through a video clip on the knowledge of hypertension to the students of class VI to X from your esteemed institution. Her interaction will not take more than 40 minutes in a day. The study will be followed up by five post-tests. The collected data will be kept confidential and will be used for only academic purposes. She will be taking written consent from the parents and assent from the children after obtaining due permission from you.

Request your permission to allow Teisovinuo Semou to collect data from your institution. Thanking you.

Sincerely,

Prof.Meena Hariharan

Centre for Health Psychology

University of Hyderabad

APPENDIX B3

INFORMED CONSENT FORM

Centre for Health Psychology

University of Hyderabad

Title of the Study: Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children

Investigator: Teisovinuo Semou

Your child is being asked to take part in a research study. It is important that you understand why the research is being done on your child and why you are being approached. Please read the information carefully to know more about the study and your child's role in it.

What is the purpose of this study?

Hypertension or high blood pressure is the most significant risk factor for cardiovascular diseases. It is a chronic condition that cannot be cured but only managed. Management of hypertension requires appropriate health belief and behavioural change. A correct and adequate cognitive base contributes to health belief leading to positive behaviour. Preventive actions against any diseases in adulthood will be far too late. This is why from an early age, knowledge intervention to enhance health promoting behaviours should be undertaken. Hence, I will be imparting hypertension education to your child through a video clip on the knowledge and management of hypertension.

Will my answers be confidential?

The data collected from your child will be strictly confidential and utilized strictly for research purposes only. You and your child's identity will not be disclosed. Names will be converted to a code number and the information collected will remain only with the investigator.

Are there any risks involved?

There will be no risk involved for participating in this study.

What are the benefits of participating in this study?

There are no direct benefits of participating in this study. However, you and your child's contribution towards the outcomes of the study will enable researchers to improve hypertension management in individuals.

I request you to read the above details carefully and understand the nature of this study. In order to seek clarifications for your doubts, you may contact me through the details mentioned below. If you allow your child to participate in this study, you will be required to sign this consent form. However, your child's participation is voluntary and you can withdraw your consent at any point during your child's participation in this study.

Consent

I, (your name), have read all the above-mentioned details carefully. I understand that my child is participating in research related to the impact of hypertension education on health cognition and behaviour in school children. I understand that my child's data provided will be treated confidentially. I have clarified all my doubts related to this study and I give my consent to my child to participate in this study.

Signature

Name:

Date:

Investigator Details:

Teisovinuo Semou

PhD Psychology (pursuing)

Centre for Health psychology

University of Hyderabad

Ph.: +919612159535

Email: soso.tei13@gmail.com

APPENDIX B4

INFORMED ASSENT FORM

University of Hyderabad

Centre for Health Psychology

I was explained about the proposed research on *Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children.* I was informed that my parent (mother/father/guardian) has agreed for my participation in the study. I wish to state that I agree to be a part of this study.

Name:

Class:

Age:

Gender:

Signature:

Investigator Details:

Teisovinuo Semou

PhD Psychology (pursuing)

Centre for Health psychology

University of Hyderabad

Ph.: +919612159535

Email: soso.tei13@gmail.com

APPENDIX B5

PARTICIPANT DETAILS FORM

Name:

Age:

Gender:

Class:

School:

Religion:

Total marks' percentage obtained in the last held promotion exam:

Contact details:

Indian Journal of Health Studies, Vol 4 Issue 2 OPEN ACCESS @ www.ahpsy.in

Hypertension Knowledge Intervention: A study on Awareness, Retention, and effect on Healthy Lifestyle Practices among Children

Teisovinuo Semou[1] *& Sandra Roshni Monteiro*[2]

Abstract

The high prevalence of hypertension and associated risk factors among school children indicate that hypertension is not restricted to older age but stems in childhood itself. Cognition related to the disease is a primary step in warranting its manifestation. Hence, this study aims to explore the efficacy of a 30-minute audio-visual hypertension knowledge intervention facilitated by a health psychologist in increasing awareness about hypertension; the retention of information, and its effect on healthy lifestyle practices among children. A sample of 100 children was recruited through purposive sampling and was assessed using the Hypertension Knowledge Test (HKT) and Healthy lifestyle Practice Scale for Children and Adolescents (HELIPSCA). Post assessing the baseline scores for HKT and HELPISCA,the children were re-administered HKT immediately after the first exposure, the second exposure (after two weeks), then after 6 weeks of first exposure, and followed up after an interval of 10 months along with a post-test administration of HELIPSCA. Results were statistically tested using paired *t-tests* which revealed a significant improvement in hypertension knowledge levels among the children. However, there was no significant change in the self-reported lifestyle practices of the children. This school-based knowledge intervention holds promise as an innovative method to raise school children's knowledge about hypertension through video-based educational intervention.

Keywords: Hypertension knowledge intervention, frequency of intervention, hypertension awareness, knowledge retention, healthy lifestyle practices.

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Hypertension is a primary causal factor for morbid conditions such as cardiovascular diseases, renal diseases, and premature deaths around the world, with developing countries bearing the brunt of the burden.High systolic blood pressure (SBP) was responsible for 10.8 million deaths in 2019 (Murray et al, 2020).The Indian population especially is going through a demographic, epidemiological, and dietary shift, which is contributing to the country's rising chronic disease burden.Banerjee et al. (2021) have reported high prevalence of hypertension and associated risk factors among school children indicating that hypertension (HTN) is not restricted to older age but stems in childhood itself. A study by Amritanshu et al. (2015) reported a prevalence of 4.7% hypertensives among children between 5-19 years. The occurrence of cardiovascular diseases among school children also is a warning sign for the Indian health care system and its impending encumbrance.

Awareness about hypertension is the first step in warranting the disease condition. Awareness encompasses the right cognition that builds a foundation for the desired behaviour to manifest. Despite hypertension being a major risk factor predicting cardiovascular mortality, a study by Divakaran et al. (2010) found that only 9.6% of the sample of children between Class 6 to Class 9 were aware of the preventability of hypertension. The gap in such crucial knowledge was also found in another study by Hariharan et al. (2018) in responses of children studying between Class 6 to Class 12 to an open-ended question “What do you know about high blood pressure/hypertension?”

It builds a strong case to formulate preventive interventions by empowering this group within the children’s age bracket by equipping them with adequate knowledge that would help them utilize cognition to motivate health promoting behaviour and avoid health risk behaviour particularly related to hypertension. This sort of “preventive readiness”is an essential prerequisite to implement reduction in risk factors scores among adults and other family

members (Monteiro &Hariharan, 2021; Monteiro & Hariharan, 2019). Though it has been established by literature that there is a positive impact of knowledge intervention among children, it is imperative to further explore the differential impact of the frequencies of knowledge intervention and its retention among children. This would help ascertain the number of repetitions that would strengthen the relationship between stimulus reception and response (behaviour). It has been noted that when children are exposed to rich knowledge related to hypertension, it has resulted in reduction of high salt food intake and reduction of cardiovascular risk scores among parents and family memberstoo (He, Brinsden, & MacGregor, 2014).The present study attempts to bridge this gap.

Research Questions

1. Will a hypertension knowledge intervention enhance hypertension related knowledge among school children?
2. Will the school children be able to retain the knowledge gained, 10 months post-intervention?
3. Will there be an improvement in the healthy lifestyle practices among school children, post hypertension knowledge intervention exposure?

Research Objectives

In pursuit of the research questions, the following objectives of the study were formulated:

1. To examine if knowledge intervention increases the levels of hypertension knowledge among the school children
2. To examine if school children are able to retain the knowledge gained, 10 months post-intervention

3. To examine if there is an improvement in healthy lifestyle practice patterns post-intervention among the school children

Hypotheses

1. There will be an increase in hypertension knowledge levels post-intervention exposures among the school children.
2. There will be retention of hypertension knowledge 10 months post-intervention among school children
3. There will be an improvement in healthy lifestyle practice patterns post intervention among the school children

Method

Study design

This study is based upon a quasi-experimental interrupted time series design (Biglan, Ary, &Wagenaar,2000).

Sample

Using purposive sampling a sample of 100 children studying between Class 7 to Class 10 from a school in Nagaland was recruited. Table 1 shows a summary of the demographic characteristics of the children.

Table 1

Demographic characteristics of the Participants

Characteristics	*N*	*%*
Age		
12-14	39	39%
15-18	61	61%
Sex		
Male	50	50%
Female	50	50%
Class		
7	25	25%
8	25	25%
9	25	25%
10	25	25%
Percentage of Exam marks		
40%-59%	30	30%
60%-100%	70	70%

Note. N = 100. Mean age of participants=14.96years (*SD* = ±1.60)

Tools

The baseline and follow-up tests were conducted using the following questionnaires.

Hypertension knowledge test. (HKT). Developed by Andrew & Hariharan (2017), HKT has 22 items with 5 multiple choice options. The respondent has to choose one correct answer among them. The items cover hypertension knowledge majorly divided into four domains—general awareness of hypertension; lifestyle factors; causes, care and casualty of hypertension; and medical management. The right response for each item is given a score of 1 and the wrong response was given 0 scoresThe score of each subscale is totalled to get the overall hypertension knowledge level. Higher scores indicate higher levels of hypertension knowledge. Cronbach's α for this sample was found to be 0.79.

Healthy lifestyle practice scale for children and adolescents. (HELIPSCA). The scale developed for the purpose of this study consists of 28 items and aims to measure daily healthy lifestyle practices in children. This scale assesses the health behaviour of the subjects of this study covering dietary behaviour, exercise or physical activity, water intake, quality of rest or sleep, screen time, hygiene, and spiritual. The responses of the subjects can range on a 4-point Likert scale from Almost always = 4 to Never = 1. Forward scoring for positive items involves 4 = Almost always, 3 = Frequently, 2 = Rarely and 1 = Never. It is reversed scored for negative statements. A higher score indicated healthier lifestyle practices. Cronbach's α for the test was found to be 0.70.

Procedure

The permission from the Institutional Ethics Committee was obtained (Ref: UH/IEC/2021/176). School administration permissions were also sought to allow the conduction of the study. One school teacher was assigned to assist the investigator to facilitate the conduction of the study. Informed consent forms were sent to all the parents of those children from Classes 7 to 10. The children whose parents signed the informed consent were given the assent form to confirm their willingness to participate in the study. Children for whom both informed consent and assent were obtained were included in the study.

Intervention

The intervention provided to the children was a 30-minute video featuring a physician and a detailed explanation of all the aspects related to hypertension such as disease's prevalence, disease mechanism, causes and casualties, medical management, associated myths and mistakes, and the consequences of non-adherence. The informational video was exposed to the children on day 1 and day 14 from the onset of the study and the immediate impact of knowledge intervention was recorded each time through the administration of HKT. The

sessions were managed by a trained health psychologist who was also able to alleviate any health anxiety caused by the video and positively remind the children of their rights and responsibilities to good health.Hypertension knowledge test was conducted 5 times–first, to obtain baseline scores (pretest scores); second, immediately after first exposure of intervention; third, a week after the second exposure of intervention; fourth, a post intervention test after 6 weeks of first intervention exposure; and fifth, a follow up testing of hypertension knowledge levels done 10months post-intervention to observe knowledge retention. Healthy lifestyle practice was also measured two times – firstly prior to the week before exposure to the intervention video (pre-test)and the next administration was done8 months post-intervention.

Statistical analyses

Data were analysed using the IBM SPSS Statistics 23.0 version for descriptive statistics such as mean, SD, and percentage and paired *t* test to assess knowledge retention, and to assess changes in healthy lifestyles practices in children compared to the baseline scores.

Results

To pursue the objectives of the study, a paired *t* test was conducted to assess the effect of intervention exposures on each of the domains of hypertension knowledge and its total compared to their pre-test knowledge levels. The results of comparison of first exposure of intervention are consolidated in Table 2.

Table 2

Mean, Standard deviation and t-values of hypertension knowledge and its subscales among school children assessed immediately after first exposure of intervention

Outcome	Before intervention		Immediate impact of intervention (Exposure 1)				
	M	*SD*	*M*	*SD*	*t*	*P*	Cohen's *d*
Hypertension knowledge (total)	4.60	2.68	6.95	2.03	16.34	.000	0.99
General Awareness	1.21	1.04	1.87	1.15	7.72	.000	0.60
Lifestyle	1.23	1.11	2.40	0.82	11.41	.000	1.20
Causes, Care, Casualty Awareness	1.17	1.12	1.50	1.12	4.11	.000	0.29
Management of medication	0.99	1.04	1.18	0.86	2.41	.018	0.20

Note. N=100.

Similarly, the impact of the second exposure of intervention was assessed again by comparing the levels of knowledge scores obtained hitherto with the baseline scores. The results are presented in Table 3.

Table 3

Mean, Standard deviation and t-values of hypertension knowledge and its subscales among school children assessed immediately after second exposure of intervention

Outcome	Before intervention		Immediate impact of intervention (Exposure 2)				
	M	*SD*	*M*	*SD*	*t*	*P*	Cohen's *d*
Hypertension knowledge (total)	4.60	2.68	8.27	2.53	22.22	.000	1.41
General Awareness	1.21	1.04	2.16	1.09	9.33	.000	0.89
Lifestyle	1.23	1.11	2.36	0.79	10.75	.000	1.18
Causes, Care, Casualty Awareness	1.17	1.12	2.05	1.14	8.91	.000	0.78
Management of medication	0.99	1.04	1.70	0.98	7.12	.000	0.70

Note. N=100.

Further, the retention of hypertension knowledge levels was assessed again at Week 4 after a second intervention exposure or 6 weeks after first intervention exposure. The results are presented in Table 4.

Table 4

Mean, Standard deviation and t-values of hypertension knowledge and its subscales among school children assessed 6 weeks after first exposure of intervention

Outcome	Before intervention		Impact of intervention (6 weeks post exposure 1)				
	M	*SD*	*M*	*SD*	*t*	*P*	Cohen's *d*
Hypertension knowledge (total)	4.60	2.68	8.03	2.50	19.89	.000	1.32
General Awareness	1.21	1.04	2.08	1.11	8.44	.000	0.81
Lifestyle	1.23	1.11	2.31	0.84	9.84	.000	1.10
Causes, Care, Casualty Awareness	1.17	1.12	1.99	1.13	8.38	.000	0.73
Management of medication	0.99	1.04	1.65	0.96	6.69	.000	0.66

Note. N=100.

Finally, hypertension knowledge levels were followed up 8 months after the first intervention exposureand retention of knowledge wascompared with the pre-test scores. The results are presented in Table 5.

Table 5

Mean, Standard deviation and t-values of hypertension knowledge and its subscales among school children assessed 8 months after intervention

Outcome	Before intervention		Imapct of intervention (10 months after Exposure 1)				
	M	*SD*	*M*	*SD*	*t* (99)	P	Cohen's *d*
Hypertension knowledge (total)	4.60	2.68	7.94	2.43	19.30	.000	1.31
General Awareness	1.21	1.04	2.05	1.01	8.47	.000	0.82
Lifestyle	1.23	1.11	2.33	.75	10.48	.000	1.161
Causes, Care, Casualty Awareness	1.17	1.12	1.92	1.09	7.59	.000	0.68
Management of medication	0.99	1.04	1.64	0.96	6.58	.000	0.65

Note. N=100.

In parallel, behavioural manifestation of a strong cognitive base was assessed by comparison of pre-intervention levels of daily healthy lifestyle practices and the follow up scores of self-reported daily healthy lifestyle practices at 8 months post intervention. The results are presented in Table 6.

Table 6

Mean, Standard deviation and t-values of healthy lifestyle practice among school children

Outcome	Before intervention		10 months after intervention				
	M	*SD*	*M*	*SD*	*t*	P	Cohen's *d*
Healthy lifestyle practices	70.75	11.84	71.87	10.26	-1.74	.085	0.10

Note. N=100.

Concisely put, there was a significant improvement in hypertension knowledge scores retained even after 10 months post intervention exposure. However, daily healthy lifestyle practices were not found to have a significant change post knowledge intervention.

Discussion

While the holistic hypertension targeted intervention in this study was found to be effective in increasing the children's knowledge about hypertension, the same was insufficient to have an impact on their health behaviour.

Hence, in concurrence, the first hypothesis is accepted that stated that there will be an increase in hypertension knowledge levels post intervention post repeated intervention exposures among the school children. It was also confirmed that the knowledge levels were retained after 10 months of intervention exposure. Previous studies have recommended the implementation of school-based intervention programmes that aim to lower the risk of hypertension and target a change in the level of knowledge and awareness about its causes, consequences, treatment, and control among school children. This is the first pillar to promotion of health safe behaviour. In a study conducted in Delhi by Yadav and Khokar (2021), school-aged adolescents' knowledge of CVDs improved considerably after receiving intervention compared to baseline.

The present study confirms the change in perception of disease among children through a simple 30-minute audio-visual educational intervention. Ferreira et al. (2016) also found that imparting knowledge about a disease through audio-visual resources improved students' knowledge and retention capacity. This format has been found to be superior than written material and been proven to be very effective in increasing knowledge and promoting health behaviour change for various chronic illnesses including cancer screening, heart failure self-care adherence, and HIV testing (Tuong, Larsen, & Armstrong, 2014).

Young school going children are an unexplored population segment who are eligible to promote health education about hypertension. The importance of school going children is that they are at anreceptive age, and thus, may absorb and disseminate powerful educational messages using their agency. Furthermore, behaviours learned at a young age frequently persist

into adulthood, resulting in significant reduction in morbidity and mortality (Curie et al., 2010). Through school children, parents and significant adults can also be the recipients of information dissemination. For instance, in a school-based study conducted by Monteiro and Hariharan (2021), there was a significant increase in hypertension knowledge before and after intervention. This study also discovered that by educating children about hypertension, the children were able to act as change agents in the management of hypertension in their hypertensive adult family members. Along with a strong informative structure, the intervention was coupled with a daily self-regulatory monitoring system for children to help them track the adults' hypertensive adherent behaviour.

Further, in view of the findings of the daily healthy behavioural practices there was no significant improvement found in the health behaviour of the children of this study, leading to the rejection of the second hypothesis. There are several reasons for low expectations for immediate preventiveness and hesitance to adopt healthy lifestyle changes. Owing to the silent nature and slow and late effects of hypertension progression, it may be difficult to translate cognition into behaviour. The current structure of academic time and multitude of nutrition deficit resources available in schools may not be providing adequate opportunities for health-promoting behaviours. Furthermore, indulging in gratifying behaviours like junk food that is oily and salty, watching television, playing video games, and easy accessibility to numerous fast-food outlets, restaurants and supermarkets may have discouraged children from embracing healthy alternatives. Moreover, as discussed previously, behavioural manifestation was not a formalized objective or outcome of the intervention which aimed to only increase the cognition related to hypertension. It is exclaimed cognition alone cannot be sufficiently be expected to translate into healthy behaviour. This is in line with health behaviour theories which state the essentiality of several other factors that propel health promotive behaviour.

Conclusion

This school-based knowledge intervention holds promise as an innovative method to raise school children's knowledge about hypertension. In addition, the video-based educational intervention could also improve retention capacity in school children. While further extensive enquiry is needed, this improved knowledge and retention could lead to better recognition and control of hypertension in the community. Hence, the educational module could potentially be replicated in all schools in hypertension-endemic countries. The findings also suggest that health education interventions should incorporate more effective strategies for transforming knowledge into practice.

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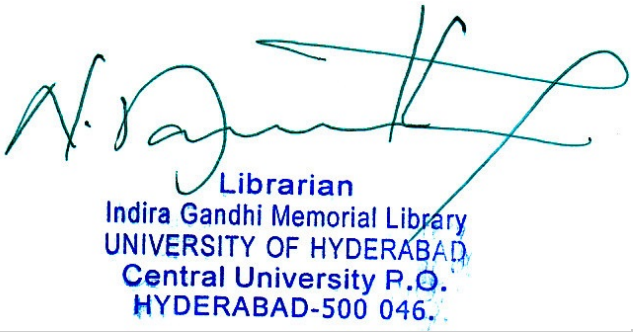
APPENDIX D

Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children

by Teisovinuo Semou



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Impact of Hypertension Education Intervention on Health Cognition and Behaviour in School Children

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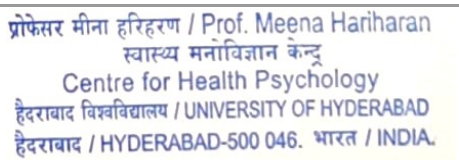

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