

Family Support in Effective Management of Hypertension: Role of Children as Passive Change Agents

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ABSTRACT

Physical health is a field which requires holistic intervention to manoeuvre individuals towards better health outcomes through promotion of health enhancing behaviour. Family support has been established as an important protective factor in any health behaviour change. However, the role of children has not been directly referred to in family health promotion. Among significant areas of concern in the field of health, non-communicable diseases have a steep rise, among which hypertension has highest prevalence and is also responsible for the alarming rate of cardiovascular morbidity projected to increase upto 44% by the year 2035 globally and in India. Involvement of children in shaping health should become a fundamental tradition because of their dual roles. Firstly, they have a responsibility as victims of the same clusters of lifestyle habits as their family members, and secondly, with their potential to influence attitudinal shift of health risk behaviours in their family members. This paper entails a comprehensive systematic literature review in light of the role of children as change agents throwing light in effective management of hypertension. Children's agency in terms of their potential, their ability, and discredit is thoroughly discussed. Scientific articles have been reported to substantiate children's influence in their family to bring out changes in health behaviour. Evidence suggest the feasibility of utilizing children as change agents to partially fill the increasing gap between supply and demand for health change behaviour needed to enhance the productivity of children as change agents is listed. Implications of study are also discussed.

Keywords: children, change agents, primary prevention, hypertension management, health promotion

INTRODUCTION

Behaviour is unique to every individual. There has always been an interest in steering behaviour towards constructive and positive outcomes. A positive behavioural change could be comprehended as a desirable shift in attitude, cognition, and affect from the less desirable response to any stimuli. Change is stimulated through various change agents employed by enthusiasts of the desired

change. In other words, there are several change agents such as media, government policies, police, authority figures, teachers, parents, interpersonal relationships, and even the self. Agents of change formulate approaches or strategies to intervene and bring about attitudinal change subsequently affecting behaviour of an individual. The aim of change agents is to support and equip persons to adopt change in behaviour to drive towards desirable individual

transactions. Relationship motivation theory by Deci & Ryan, ^[1] and Organismic Integration theory by Moss ^[2] as explained under self-determination theory discusses the factor of relatedness and autonomy in interpersonal relationships which facilitate motivated changes in health behaviour. Similarly, Bandura's ^[3] social cognitive theory has also stressed on the influence of external stimuli and social factors in behavioural intentions and behavioural change.

Physical health is one such field which is gaining a lot of attention from all health interventionists-clinicians, researchers, health psychologists, media- to maneuver individuals towards better health outcomes through promotion of health-enhancing behaviour. To bring about a change, it is necessary to comprehend and subsequently modify causal factors of health-debilitating behaviour. Probably the cause behind poor health management is the inertia caused due to external attributions made by the individual (Kelley ^[4]). The high prevalence of the health-risk behaviour unfortunately leads to high consensus; development of norms (smoking, unhealthy diet, lack of sleep, etc.) posing risks to health automatically lowers the distinctiveness; along with heightened complacency over the course of time causing high consistency in health risk behaviour. Self-management is the key to good health (Grady & Gough ^[5]), which is triggered through positive attitude and appraisal of declining health condition. The need is to translate the positive attitude into a practice and action system, also known as self-care (Barlow, Wright, Sheasby, et al ^[6]). It is important to note that self-care occurs in a contextual space and not in isolation (Gallant ^[7]). Self-care requires the support of health care providers, community members, friends, and primarily family members (Rosland et al; Rosland, Heisler, Choi, et al ^[8,9]). It is conjectural to say that involvement of family members may prove to be either facilitating or impeding. According to systems theory, change in

lifestyle of one component, i.e. change in at least one family member's habits or health behaviour, brings about a change in lifestyle for other family members (Ryan & Sawin ^[10]). If the change in health behaviour is positive, it could be a beneficial choice of lifestyle for other family members. However, a few qualitative studies have pointed out the negative effects of familial support during illness. Individuals with a sense of autonomy and an internal locus of control suffering with chronic illness feel guilty of burdening other family members in aspects of psychosocial care provided to them, and may often be criticised or badgered about the strict discipline required to deal with the disease (Carter-Edwards, Skelly, Cagle, et al; Sandberg, Trief, Greenberg, et al ^[11,12]). Family members may also hinder patient health outcome or become a barrier in their management (Gallant, Spitze, & Prohaska ^[13]) as they may not like to follow the same diet, or may cause embarrassment about self care, or may make more demand for their time than they can make do of their role in their family.

Though there is no direct reference to the role of children in the family, children are important members of family thus causing a need to inquire their role in family health promotion. There is a paucity of research in the area of health to explore the dynamic role of children in their family. Involvement of children in shaping health should become a fundamental tradition because of their dual roles- their responsibility as victims of the same clusters of lifestyle habits as their family member(s), and their potential to influence attitudinal shift of health risk behaviours in their family members. The United Nations Conventions on the Rights of children furthermore recognizes that children should be accepted, acknowledged, and encouraged to participate in decisions concerning their lives (Skelton ^[14]). Alderson ^[15] described children as influential means of change, as they are involved in daily life activities of which all children and youth are a part of in

some way. Assuming the reciprocal power to exert influence, referred to as “circular causal process” (Olson & Cromwell [16]) it is deemed to be a relationship between the perception of the child’s own influence on the parents; and the perception of parents about the influence of the child, although it will not be identical (French, Cartwright, & Raven [17]).

This paper entails a comprehensive systematic literature review of the role of children as change agents in healthcare, especially in the case of management of hypertension and cardiovascular disease. As a purview, research studies from diverse fields have been reviewed and children’s influence in several contexts is used to emphasize upon their agency. Strings used to search for research papers were- “children as agents of change”, “children as health change agents”, “cardiovascular health AND children as change agents”, “hypertension AND children as change agents”. Snowball referencing was also used as adjoining search for suitable articles. No limit was specified for the years searched, hence, certain long-standing references have also been made to justify certain viewpoints to strengthen the connotation of children’s agency.

Can children be good agents of change in general?

There are several reasons for focussing on children to enable change. Firstly, attitudes formed at an early age will be stable, enduring changes through adulthood (Asunta [18]) thus securing positive desired behaviour for subsequent generations. Secondly, the opinion and discern of children is highly rated by their parents (Thornton, Shaw, & Williams [19]). There has also been a progressive body of literature appreciating the bi-directionality of relationships between children and adults (Ambert; Kuczynski, Harach, & Bernardini; Knafo & Galansky [20-22]).

Research done in consumer behaviour has found that children influence

their caregivers’ decision in purchasing, and markets often use this to strategy to promote grocery items (Powell, Langlands, & Dodd; Wilson & Wood [23, 24]). A study done by Hunter [25] reported that children influenced 80% of parents’ decisions, and was indicated through a 54% rise in parental spending. Ryan [26] also notes that satisfying the children generates a sense of gratification in the parents. Marketing studies have also accounted that nagging and requesting for specific items was one of the direct methods of children to influence purchasing by the parents who bought it despite the food item being unhealthy (Henry & Borzekowski; Maubach, Hoek, & McCreanor; O’Dougherty, Story, & Stang [27-29]). A qualitative public health survey highlighted that when parents shop with their children, they tend to forego important health related information such as reading nutrition labels in order to avoid the hassles of dealing with children’s demands (Maubach, Hoek, & McCreanor [28]). The emphasis of these studies should be the type of interactions between the parent and the child, independent of the context, and the shift in contention of parents regarding their children’s view.

Children’s role in sharing knowledge with their parents or adults in the family has been explored in a handful of studies. Children have been seen to have an affirmative impact on their parent, guardian, or another significant adult by dissipating issues requiring awareness (Saphir & Chaffee; McDevitt & Chaffee [30, 31]). Ronan and Johnston [32] identified a school programme which was an effective format emphasising upon the interaction and homework to be completed with parents and guardians in order to increase levels of family disaster preparedness.

Children as effective agents in the context of health and hygiene

This idea is replicated by research studies such as one prospective, quasi-experimental study in Kenya revealed that health education provided to children on

various disease conditions improved the home and school environment and found the children to have better modified behaviour than the parents, who also had improved knowledge about the diseases (Onyango-Ouma, Aagard-Hansen, & Jensen [33]). Studies in different areas (Damerell, Howe, & Milner-Gulland; Vaughan, Gack, Soloranzo, & Ray [34, 35]) have proved that there is inter-generational transfer of knowledge from child to parent.

Along the lines of this perspective, Christensen [36] has saliently remarked: *“For the child to develop independent agency in relation to their own (and others) health and well-being the key aspects suggested are: self care (physically, emotionally and socially), personal care and hygiene, keeping fit and active (physically and mentally), developing and maintaining connections (including relations of care, responsibility and obligation) with parents and peers, balancing and managing everyday risks, developing knowledge and health-related skills and competencies, developing positive values and meaningful goals for own health, well being and health behaviours, and the ability to consult and use health care services.”*

Considering the agency of children in an encouraging light, it should be a prerogative to target children as change agents of health. As a part of the initiative for hygiene interventions in a rural town of Zambia, qualitative research revealed that pupils were able to catalyze changes in health behaviour of hand washing through construction of hand washing stations at home and its implementation through and in their family members (Bresee, Caruso, Sales, et al [37]). There have been other instances where children learn about water usage, sanitation and health risks at school and pass this information onto their friends, parents and the wider community (Gibbs, Mann, & Mathers [38]). Yet another participatory educational approach (Mwanga, Jensen, Magnussen, et al [39]) in Tanzania showed that school children actively pursued their role as health change

agents and challenged conventional African views of power, status, and wisdom usually associated with old age. There were a few barriers that were identified in the educational approach like programme of study, time limitation, class size, teaching materials, and working conditions.

Other school-based interventions were effective in educating children and adults of their family in terms of increased physical activity (Rhodes & Lim [40]), reduced salt intake and lower blood pressure among adults of their family (He, Wu, Ma et al [41]). An intervention for Sri Lankan students (Yuasa, Shirayama, Kigawa, et al [42]) accomplished improving the parents' behaviours regarding dietary patterns, hygiene maintenance, lifestyle habits, and physical exercise. The adults reported a direct and indirect shift in their attitudes and awareness which resulted in improved health quality. This study stressed that for better and effective health intervention programs children should be motivated to spread health knowledge after it is provided to them.

Can all children be change agents?

A rational concern emerges at this point, i.e. can we depend on children's opinions? The answer lies within the child, who is being socialized through external agents in the environment. An Indian study which focused on the agency of children as peer educators for ear health established through an experimental method that children are as effective and reliable as adults in dissipating message of health and hygiene (Sonavane, Deepthi, Rodrigues, et al [43]). Children also have an autonomous and independent way of life in their formative years since in most families both parents are working individuals (Dotson & Hyatt [44]). As a positive appraisal of this context, Golombek [45] has added that children in order to be agents of change require to incorporate the 5 C's- character, confidence, connection, competence, and contribution. Molloy, White, and Hosfield [46] have distinguished the benefits and

obstacles of the participation of youth and children as change agents. A few of the motivational benefits as stated were the beliefs related to the increased regard for themselves for being able to express their views, and to be considered in any decision making process. Involving children would enhance their confidence to make a difference stimulating them to explore more ways of participation and simultaneously develop background knowledge, comprehend emulation of an adult, and boost self-confidence. Children also tend to be less prejudiced by indoctrination, religious beliefs, and fatalistic beliefs (Pilgrim [47]).

Few inhibiting factors as studied were- importance of other priorities, scepticism about efficacy of participation, shifting of the responsibility to adults or paid individuals in charge of the job, lack of awareness, involvement, self-confidence, knowledge, and negative peer group influences. Iyengar and Jackman [48] also listed the presumptions of adults concerning child influence. Adults believe that children lack in commitment, are self-absorbed, undisciplined, and are not interested in long term plans. They also feel that children are temperamental, inexperienced, and interested only in fun.

A child is exposed to unprecedented technological environment - television, print, media, for an average of 5.5 hours per day (Dotson and Hyatt; Singer, Singer, D'Agostino, et al [49, 50]). This kind of contact with the external world has made the children more knowledgeable than their parent (Francisco [51]). So the ratio of children's input to parents' is compatible with retrieved information from external socialization agents. Iyengar and Jackman [48] have contradicted this viewpoint and stated that there is an overrepresentation of children as media and internet users, as a large section is uneven in terms of technological knowledge.

Another factor in the reliability of children's influence is their unique and dominant position because of the new

family structures- single parenting, co-habitation, longer wait for marriage, and delayed childbirth- which collectively suggest the different decision-making environment, where their position has increased to an active decision maker in the family (Flurry [52]). Labrecque and Ricard [53] found that children from non-traditional family demonstrated larger influence. There are families where the child plays the role of a translator-mediating change and passing information. It is a useful mediatory process where the child passes on information to the parents or grandparents in a language easily understood by them (Mitchell, Tanner, & Haynes [54]). This is especially valuable in poor and marginalised households where the children's literacy level is more than the adults. Children were also reported to have been closer and confiding in their mothers about their views and concerns, and believed that mothers would pass on the information to the fathers if they found it important. This view was endorsed by mothers who unanimously agreed that their children would turn to their mothers more than anyone else when they had issues and problems (Mitchell et al [54]). An intervention study on hygiene, contrarily, found more personal interaction with the fathers-the heads of the family- to help with the implementation of the sanitation and hygiene facilitating construction (Bresee et al [37]). However, it is imperative to acknowledge that not all children in vulnerable societies live in a 'perfect' family environment, implying that interpersonal relationship may be dissimilar for each family.

Need for out of box thinking in enhancing adherence in cardiovascular diseases

Among other significant areas of concern regarding health which include hygiene, sanitation, obesity, lifestyle factors, and non-communicable diseases, the spotlight must be on one of the most globally prevalent and fatal disease-atherosclerotic cardiovascular disease (CVD). According to World Health Report by WHO, [55] the largest cause of death and

disability in India by 2020 will be due to CVD. High blood pressure or hypertension is the most directly attributable cause of CVD, and is a significant health burden on the health care system (Leeder, Raymond, Greenberg, et al; Reddy, Shah, Varghese, et al [56, 57]). The scenario in India suggests that 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India can be blamed on hypertension (Gupta [58]). High prevalence of this dangerous risk factor is primarily due to the shift in lifestyle and urbanisation in India. The biggest challenge for poor blood pressure control in the hypertensive population is because a large section of people are not aware of the symptoms or the severity of the disease (Wang, Kong, Ma, et al [59]), and hence do not pursue self-management in terms of medical help, behavioural change, and emotional regulation (Corbin & Strauss [60]). In India more than half of the hypertensive population are not remotely aware of their elevated blood pressure, and among those who are aware only 60-80% of the individuals are treated with medication, and even they do not address all the risk factors completely (Devi et al; Gupta and Yusuf [61,62]). Surprisingly, only a small percentage (10-15%) of Indian people with hypertension has their blood pressure under control through systematic management. Socioeconomic conditions (Gupta & Gupta; Subramanian, Corsi, Subramanyam et al [63,64]), comorbidity such as hyperglycaemia (Hanover [65]) and quality of healthcare services provided (Wee & Koh [66]) are certain parameters which also decide the facilitation of management of hypertension, and are not modifiable with ease. India is racing in cardiovascular deaths at least a decade faster (decline of 60% in the US compared to a 300% growth in India) and younger than their counterparts in other countries (52% deaths in India compared to 23% deaths in other developed countries, under the age of 70). Preventive lifestyle modification is the best battle that is to be fought that could secure the harsh realities of cardiovascular health in India.

A child as a part of the initiative to manage hypertension is not simply an alternative approach. It is a mandatory need as identification of risk factors of hypertension begins as early as childhood and adolescence, making them concurrently vulnerable to the disease across the domains of behavioural, environmental, genetic, and physiologic endowments of their lifestyle shared with their family (For, E. P. O. I. G., & Children, R. R. I.; Gupta et. al; Patil & Garg, [67-69]), and also tracking of their adult CVD health status. This is supported through a research finding centred on the need to lower cardiovascular disease which was conducted in school children to screen for cardiovascular risk (Berenson, Srinivasan, Bao, et al; Barker & Hanson; Barker [70-72]). The findings successfully predicted risk in their parents and there was a significant association in lifestyle and cardiovascular risk between parents and children (Schwandt, Bischoff-Ferrari, Staehelin, et al; Haas, Liepold, & Schwandt [73, 74]). An Indian study (De, Mookerjee, Guha, et al [75]) conducted to capture the prevalence and sustained elevation of blood pressure in children documented that 37 out of a sample of 289 children between the age of 5 and 15 years had primary hypertension as per definition. Out of the diagnosed 37 children, 24 of them had a family history of hypertension. Another Indian study by Patil, Patil and Patil [76] reported similar phenomenon of occurrence of hypertension in their sample of children between the age group of 13 to 15 years.

Use of children as change agents in cardiovascular diseases

Recent research has highlighted the upward trend in prevalence of hypertension from 0.5% to 11.7% between 6 to 18 years of age who suffered from primary hypertension (Roy & Ghosh [77]). Obesity was found as one of the risk factors. Further, the projections show that by year 2035, 45.1% of the population globally (Khavjou, Phelps, & Leib [78]) and 44% of Indian population (Gupta, Gaur, & Ram [79]) will suffer from primary hypertension. Such

statistical data should invoke the wisdom of methods of handling the contemporary problems of childhood hypertension and future problems of enhanced prevalence. This is possible by educating the children of contemporary issues. This attacks both problems in one shot because the cognitive base created in children enables those diagnosed with hypertension to handle it effectively, and the others to take measures for preventing now as well as the future when they constitute the adult population for which the projections are given. The third advantage will be in influencing the adults in their families for total adherence. Banerjee [80] from Pune, India reported that more than half (61.16%) students of 9th and 10th standard considered reduced physical activity as a risk factor for cardiovascular disease. Their knowledge regarding other risk factors was even lesser than this proportion. These findings are a vital tool in comprehending health awareness in children because healthy practice reflects associated sound knowledge of health state.

To actively enable children in preventive health care, it is important to gauge the knowledge level of children. A study conducted by Hariharan, Andrew, Kallevarapu, et al [81] using mixed methods studied the conceptual basis of hypertension in 776 students of 6th to 12th standard, where in general the children's understanding was found to be inadequate, and 22.57% of responses indicated misconceptions. Another baseline assessment of CVD related health awareness conducted through a survey of 2995 ninth and tenth grade students in the rural district of West Midnapore, India (Ray, Guha, Ray, et al [82]) showed that students scored less than 50% which enlightens the incomplete knowledge possessed by children. Cardiovascular risk factors were studied and related knowledge level was assessed in 485 school children of Delhi in India (George, Sharma, Ramakrishnan, et al [83]). Of the total, a meager quarter of the children had sufficient knowledge related to cardiovascular risk factors. This is peculiar as one-fifth of the

students had a family history of cardiovascular disease. In fact, hypertension was already a morbid occurrence in the children where 6.8% were diagnosed of stage 1 hypertension and 1.4% of stage 2 hypertension. Of all, 12.4% of the children lingered in the pre-hypertension stage. An assessment of other risk factors revealed that only about half of the pupils were physically active for a minimum of 1 hour everyday (as recorded of the previous week of the assessment) and only 42% of the children consumed fruits and 76% of the children consumed vegetables. It was also found that 11.5% were overweight and 9.5% of the children were obese (another vital risk factor of hypertension). Although a very small percentage of children reported the consumption of tobacco, it remains an important statistic to note which highlights that children as young as 11 years are exposed to the risk of smoking- a contributor of the morbid disease.

Lifestyle Education Intervention

Along the same lines, children have also helped to dissipate awareness of lifestyle risk factors. A health education program that engaged school children to act as change agents for promotion of a healthy lifestyle of their mothers was conducted in a Sri Lankan school following a 12 month cluster randomized trial in 8th grade students and their mothers. The program proved to be effective in employing children as change agents of family's lifestyle which was observed through weight reduction and increase in physical activity of their mothers (Gunawardena, Kurotani, Indrawansa, et al [84]). A school health education program in Sousse, Tunisia (Harrabi, Maatoug, Gaha, et al [85]) also showed a significant improvement in children through a year of intervention incorporating educative activities pertaining to usage of tobacco, need for physical activity, and consumption of healthy diet. Towards the final stage of intervention, more children adopted the habit of walking to and from school and practicing sport. This is especially valuable in the light that obesity is also a risk factor

of hypertension which may or may not be symptomatic in childhood in addition. The risk is higher if there is a positive family history of hypertension and/or CVD (Falkner ^[86]).

Hypertension & CVD Knowledge Intervention to children as the preliminary step

Reducing the risk factors of hypertension in any phase of life including childhood and adolescence would inevitably delay progression towards clinical cardiovascular disease and improve overall prognosis in the long term (Raj ^[87]). Starting from early childhood and implemented in school and familial settings, a few interventions centred on the need to reduce risk of CVD and efficiently manage hypertension have been conducted.

Ray et al ^[82] provided a simple and cost-effective intervention in West Midnapore, India, after a baseline assessment of the 2995 ninth and tenth standard students' knowledge across six domains of CVD health (concept, prevalence, risk factors, role of healthy lifestyle practices, multidisciplinary approach, and benefits of the approach). The intervention seemed to have a modest improvement in cardiovascular related knowledge. Importantly, children learned of their ability to modify cardiovascular health through simple lifestyle changes.

A Prevention Education Program (PEP) (Schwandt, Geiß, Ritter, et al ^[88]) in Nuremberg, Germany was successful at reducing cardiovascular risk factors in adults and children. The program was conducted for a period of 10 years which included regular home visits, health education, and group sessions. Another prospective randomized community based study aimed at school going children aged between 6 and 10 years to reduce cardiovascular risk in their parents was conducted in Brazil for a period of one year by Fornari, Giuliano, Azevedo, et al. ^[89] It compared intervention provided to their control group (written educational material)

and experimental group (multidisciplinary-weekly educational programme along with written educational material). Post intervention, there was a significant reduction in cardiovascular risk for all the parents in the experimental group. Those disposed to cardiovascular disease in the experimental group also had a much higher reduction (91%) than the predisposed cardiovascular risk parents in the control group. These studies draw attention to the information that if children are educated via the correct medium and are equipped with full knowledge, they can help in curbing the risk associated with deadly diseases such as CVD.

CONCLUSION

Cumulative research evidence exemplify children's active role as responsible citizens concerned with the wellbeing of their community, and suggest that there is considerable potential for children's and young people's voices to act as agents of change. As agents, children are capable of applying strategies and drive situations in their favour as well as adjust with available resources and limitations. Nonetheless, there are a few methodological issues that raise issues about demonstration of influence of children on parents. It is extremely difficult to attribute unique variance as children and parents have too many commonalities between them (Harris; Maccoby & Martin ^[90, 91]). Moreover, research in this area is young and limited, and it is difficult to distinguish the influence of a third party or external media. The research is only limited to the influence of children on parental behaviour, whereas beliefs, values, and attitudes are untouched area. Knafo and Galansky ^[22] noted that "if children *can* influence the values of their parents does not prove that they *do* influence their parents. More evidence is needed from naturally occurring adult-child interactions as well." The presence of more than one sibling may have contradictory or additive influence on the parent. In light of existing methodological flaws, Kumar, Ray,

Mahapatra, et al [92] have described an elaborate intervention protocol- the CRRIS study protocol to reduce cardiovascular risk in school students. Although difficult to implement and lacking a holistic perspective, it carves a pathway for researchers to formulate and conduct intervention studies for school children and harness health enhancing behaviour in children and their caregivers.

The under-researched area opens a wide arena to supplementary motivating questions which would help understand the influence of children on parents, in depth. Firstly, it is important to understand the characteristics of children that may affect parents. Likewise, the characteristics of parents that influence children must also be explored. Secondly, the domains where influence would be acceptable bi-directionally are yet to be analysed. There are several more gaps in this field which needs to be understood to enable children as leverage to positive changes.

A *narrative synthesis* of 9 studies that met the inclusion criteria, were evaluated based on outcome of the intervention to establish the catalytic process of children in dissipating information and establishing themselves as effective change agents. An Indian study conducted by Sonavane, Deepthi, Rodrigues, et al [43] on 212 students who were educated about ear health proved to be successful dissipaters of knowledge to other children proving to be effective agents of health. In another study by Kamo, Carlson, Brennan, et al, [93] children aged between 10 - 14 years were successful in strengthening community approaches toward reducing the risks and stigma of HIV/AIDS. School based interventions for transference of knowledge have also been seen to be successful. The potential effectiveness of 363 students was also studied (O'Reilly et al [94]) in grades 4–8, which was assessed in terms of parents' awareness of correct 'WaterGuard' use to reduce chlorine residual in stored water as taught to them by their children. Parents who reported that

their children influenced their water treatment behaviour had a higher degree of awareness than those who reported no influence. Additionally, 25% of parents reported changing their handwashing behaviour based on what their child taught them, and 38% were able to demonstrate the handwashing procedure taught to their children representing fairly high awareness of the correct technique. Results also suggested that membership of safe water clubs may have enhanced children's role as agents of change. In other community based study in Lao, PDR by Nonaka, Kobayashi, Jimba, et al, [95] participants were 130 school children in grades 3-5 at two primary schools who demonstrated themselves as successful health information messengers for malaria control, after an intervention was given to them for a duration of 1 month. Another evidence was acquired from the report of Simovska and Carlsson, [96] who guided 2300 children (4-16 years) in 73 schools in both school and community level policy making provisions and affordances regarding healthier diet, regular physical activity establishing them as successful health promoting changes agents. A qualitative study of a food intervention in a primary school by Ensaff, Canavon, Crawford, et al [97] reported that when intervention which was in the form of semi-structured focus group discussions (76 7–9 year old pupils, 16 parents) and interviews (with head-teachers, catering managers and specialist staff) promoted pupils' greater food awareness, appreciation and skills, and pupils acted as agents of change, influencing cooking and food choice at home. These short term outcomes have the potential to lead to longer term outcomes including changing eating behaviour and diet. Out of 25, 6 children were found to be acting as change agents between 6 and 13 years of age for adult food and physical activity behaviours in American Indian households in the Upper Midwestern United States (Gadhoke, Christiansen, Swartz, et al [98]). In view of community development too, such as for Palestinian refugee camps

10-14 year Palestinian refugee children who lived in the camp learned skills from the project and reported feeling empowered and being able to make a change in their own development and their communities. This was corroborated with other groups involved who confirmed the powerful agency of children (Makhoul, Alameddine, & Afifi, [99]). In terms of environmental practices, it was accounted that there was a spillover of environmental education practices inculcated for children over to family members (Hiramatsu, Kurisu, Nakamura, et al [100]). One qualitative research was doubtful of the capacities of children in energy saving message. In French-speaking Belgium in 2007-2008; data were gathered in 13 families whose elder child is 10 or 11 years old by Bartiaux. [101] Results indicate that the child is neither powerful nor passive, nor a trustful carrier of energy-related 'good' practices. However, the sample size of this report does not seem sufficient to base general conclusions for children's potential to be change agents.

The dissipation of health education is seen as the most effective front with children being agents of change. There is also evidence that in pluralistic medical settings children engage in self-treatment of their everyday illness episodes, thus becoming more or less autonomous health agents (Geissler, Nokes, Prince, et al [102]). Also, school-based programmes are an ideal setting and student friendly (Harrabi et al [85]) facilitating peer education as well. The need for policy making and inclusion of awareness about diseases and its risk factors as a part of school health education programs is also stressed upon by Mendis [103] in her editorial letter in the *Indian Heart Journal*.

Furthermore, the potential of children as health agents should be seen in the context of their social environments (e.g., school and home). Children as social actors are surrounded in larger societal framework, which includes power and knowledge hierarchies. These may enable or

constrain their ability to act as change agents (James & Prout; Onyango-Ouma [104, 105]). Developing countries such as India are most vulnerable to the risks of grave non communicable diseases due to its competitive pace and lack of awareness of health risks. It must be a collective effort to control the epidemic of non communicable diseases. In India, over 200 million children go to school and therefore can become wide range communicators of health when equipped with the right knowledge through school education programs. Curriculum designing in this line would go a long way in the application of skills in the area of health as well as constituting a strong public awareness programme that targets adolescents. This would be a long term investment in safeguarding health of the children themselves and adults, ensuring economic, social and personal security and wellbeing. As suggested by the review, comprehensive health education interventions need to be planned and implemented. For this to be fulfilled, research needs to be conducted to test the efficacy, durability, comprehension and impact of health intervention models for children. Such research is likely to have positive implications in the area of health, school education, and child development.

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How to cite this article: Monteiro SR, Hariharan M. Family support in effective management of hypertension: role of children as passive change agents. *Int J Health Sci Res*. 2019; 9(6):363-377.
