

Transforming nutritional behaviors of basic school children through school-based participatory nutrition education program: A study protocol

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Abstract

Dietary habits build on in the formative years persist across the lifespan; therefore, developing healthy nutritional behaviors is crucial among school-going children. The school education can be a powerful influence in modifying the nutritional behaviors of children. Available evidence indicates that school-based nutrition education may promote improved dietary behaviours of school children if it is integrated with motivation, action, and a supportive environment. This study aims to design, implement and evaluate a school-based participatory nutrition education program (SBPNEP) to transform the nutritional behavior of students through participatory action research (PAR). This study uses a transformative mixed-method design as part of the PAR methodology. Five co-educational community schools are selected from Chitwan district of Nepal following the inclusion criteria of NORHED Rupantran Project under Tribhuvan University. Among the five schools, one is selected as the 'action school' where intervention sessions will be implemented. The remaining four schools serve as the 'reference schools' where effective intervention components of the action school will be replicated. Basic school students, their parents, basic school science and health education teachers, and school leaders are the co-researchers of this study. Both quantitative tools and qualitative methods will be used to generate the data. Quantitative data will be analyzed using inferential statistics (bivariate and multivariate), whilst the interpretive phenomenological analysis (IPA) method will be used for meaning making process of the qualitative data. Three components of the intervention also said to be PAR cycles: 'sensitization and motivation', 'nutrition pedagogy' and 'creating a supportive environment for sustainability' will be implemented following an iterative process of planning, acting, observing, and reflecting of the PAR cycle. The effectiveness of the intervention activities will be evaluated under three phases: short-term, mid-term, and long-term.

Keywords: *Basic school children, Community school, Nutritional behavior, Participatory action research, School-based participatory nutrition education program*

Introduction

It is widely acknowledged that school-age children pass through rapid physical growth and cognitive development (Gullotta et al., 2014). It is vital for children's growth and development that the nutritional requirements during this period are met (Centers for Disease Control Prevention (CDC), 2011). Acquiring nutritional requirements depends upon many factors, including how well healthy dietary habits are developed during the formative stage of life (Shrestha et al., 2020). Evidence indicates that dietary habits acquired at an early age persist across the lifespan (Kelder et al., 1994; Neupane, 2014); therefore, developing healthy nutritional behaviors is crucial for children. Healthy nutritional behaviors acquired during this age contribute not only to physical growth and cognitive development but also to ensure regular school attendance, thereby increasing the likelihood of positive learning outcomes (Acham et al., 2012; Ministry of Education and Sports and Ministry of Health and Population, 2006). Conversely, if school children develop unhealthy nutritional behaviors, it may lead to poor health outcomes (Centers for Disease Control Prevention (CDC), 2011). Under or overnutrition during school age impedes the growth and development of young children (Akhtar, 2016). Consequently, it negatively impacts health, work capacity, and quality of life across the lifespan (Gullotta et al., 2014). School-going children spend five to six hours at school throughout the day, where they consume school meals, popularly known as *Diwa Khajain* Nepal at mid (Government of Nepal, 2076 BS).

Schools are perceived as the trustworthy settings that shape young children's behaviors (Centers for Disease Control Prevention (CDC), 2011; World Economic Forum, 2020). School as a social adaptive system exhibits a diverse group of change agents. These include the teacher as a mentor and role model, school nurse as a caregiver, the custodian as a guard, counsellor as a motivator, administrative staff as a facilitator, and the school management committee as a policy maker (Keshavarz et al., 2010). Schools can make a substantial contribution to student's health and wellbeing (Langford et al., 2014) and thus promote healthy behavior at a large number within a single setting more effectively compared with others (Townsend & Foster, 2011). In this regard, Contento (1995) argued that the school environment can powerfully influence the nutritional behavior of young children. Moreover, students may imitate dietary behaviors from their classmates and teachers within a single setting (Story et al., 2002; Wouters et al., 2010). The food service system at school canteen is another organizational level influence for school meal consumption behavior of students (Evenhuis et al., 2020). School health and nutrition-related policies are crucial to shape the healthy nutritional behaviors among students. The public policy related to health and nutrition from local, provincial and federal governments plays a determining role in promoting nutritional behavior of school children (Micha et al., 2018). Ministry of Health and Population and Ministry of Education and Sports jointly endorsed National School Health and Nutrition Strategy-2006 aimed to improve school children's health and nutritional behavior through skill-based health education and nutrition services in school settings. Recently, both Multi-sector Nutrition Plan -I and II (National Planning Commission, 2017a) and the National Adolescent Development and Health Strategy (Ministry of Health and Population Nepal, 2018) have also focused on improving the nutritional behavior of school children. These strategic actions are streamlined together with Sustainable Development Goals (SDGs) particularly, SDG-2 'end hunger, achieve food security, improve nutrition, and promote sustainable agriculture' and SDG-3 'ensure healthy lives and promote well-being' (National Planning Commission, 2017b).

The participatory action research (PAR) approach to catalyzing positive change has been expanding globally from high to middle- and low-income countries in social science, public health, and educational research (Baum et al., 2006). In the educational field, PAR has been used as a methodological approach to improve curriculum and professional development, educational programs, and system planning and policy development (Jacobs, 2016). Since then, PAR has been widely used in educational research to address educational problems and the most effective strategies to transform classroom pedagogy. PAR is an emancipatory lens to view the world based on critical social science theories and a participatory worldview, which involves research participants in all phases of research from needs assessment to outcome evaluation (Jacobs, 2016). The use of PAR methodology in South Asian countries began in the 1970s (Kidwai et al., 2017) and 1990s in Nepal (Gibbon, 2002); however, there is limited literature on PAR-based studies in South Asian countries, particularly in Nepal. Thus, this study would provide robust evidence on designing, implementing, and evaluating a school-based nutrition participatory nutrition education program (SBPNEP) to transform the nutritional behaviors of school children using PAR as a methodological approach.

Research questions

This study proposes to design, implement, and evaluate an SBPNEP through the PAR approach to improve the nutritional behaviors of basic school children in collaboration with school stakeholders. The following specific research questions have been posed.

- What are the existing nutritional behaviors of basic school students? What multi-level factors influence their nutritional behaviors?
- How can SBPNEP be designed, implemented and evaluated in collaboration with school stakeholders?
- What pedagogy of nutrition education would be contextual to transform the nutritional behavior of students?
- What opportunities and challenges do a PhD researcher experience while designing, implementing and evaluating the SBPNEP?
- To what extent can SBPNEP transform the nutritional behaviors of students?

Methodology

This study uses PAR as a methodological approach. PAR methodology is a systematic and rigorous approach to action inquiry that enables the researcher(s) and co-researchers to co-construct the knowledge through collaboration (Denzin & Lincoln, 2011). PAR involves both researcher and co-researchers at multiple recurrent cycles consisting of the planning, acting, observing, and reflecting on the PAR cycle (Heslop et al., 2017) to co-create the knowledge by involving them in the action inquiry. The researcher and co-researchers will have a dialogical relationship with each other.

Study design

This study uses a transformative mixed-method design (McNiff & Whitehead, 2006; Mertens, 2007), which consists of a hybrid methodology (Taylor & Medina, 2013; Taylor et al., 2012). It combines quantitative and qualitative methods into a single study following the parallel-

convergent design (Sendall et al., 2018). This method bridges the limitation of quantitative and qualitative research alone (Creswel & Poth, 2018). PAR mixed method can answer a broader range of research questions because the researcher is not confined to a single method or approach, instead, one adopts multi-epistemic approaches to answer research questions (Bryman, 2017; Mertens, 2007).

Study site and rationale of the selection

This study is located in Chitwan district, which lies in the central Terai, Bagmati province of Nepal (Government of Nepal, 2015). Five co-educational government-funded community schools are selected for the study, where one of the schools is served as the 'action school' where all the intervention activities will be implemented and the remaining four schools are selected to be 'reference schools', whereby effective intervention activities of the action school will be eventually replicated at the end of the study year. The schools were selected after consideration of the inclusion criteria developed by the NORHED Rupantaran project¹. The project is implemented from 2017 to 2021 (though it has been extended to mid of 2023 due to the Covid-19 pandemic) under the tripartite collaboration among three research partners: Tribhuvan University, Kathmandu University, and the Norwegian University of Life Sciences. The project aims to catalyze improvements in the quality of teaching and learning at the basic education level in Nepal through developing innovative, transformative and contextualized pedagogical approaches through PAR. The inclusion criteria of the school comprised of co-educational government-funded multi-ethnic schools, indigenous and disadvantaged groups of students, motivated teachers willing to engage in action research, an active and functional school management committee (SMC), a parent-teacher association (PTA), school child clubs, and a suitable place for an ecological sanitation (EcoSan) toilet and school gardening activities. The needs assessment (baseline study) reveals that the school's catchment area covers two-thirds of the underprivileged ethnic *Janajati*, *Adhibasi*, and *Dalit communities*.

The co-researchers

Research participants are considered co-researchers in PAR, as they collaborate among the researcher(s) throughout the study process (Jacobs, 2016). The study includes basic schoolteachers, students from fourth to eighth grades, school child club members (child club, eco-club, and junior red cross), basic school children's parents, school leaders (headteacher, SMC, PTA), and the PAR committee members as the co-researchers (school stakeholders). They will be involved throughout the study, from needs assessment to developing, implementing, and evaluating the SBPNEP to promote healthy nutritional behaviors in schoolchildren.

Data collection methods and strategies

PAR is a holistic approach to problem-solving rather than a single method for collecting and analysing the data. The research questions of this study also inform us to generate multiple nature of data from different sources. Therefore, this study deploys hybrid methods for data collection. As McNiff and Whitehead (2006) suggested, 'paper and pen techniques', 'live techniques and ostensive techniques' will be used to generate the data.

1. Home - Rupantaran

Under the paper and pen techniques, the questionnaire will be developed through collaboration with teachers as co-researchers. For this, we will discuss the nature of the questions to be considered. For that, we will spend a round of discussions to select the questions related to students' knowledge, attitude and practice. Then the questionnaire will be administered by collaborating with teachers. Similarly, a food diary will be used to assess school meal consumption to monitor food intake behavior among the students (Ortega et al., 2015). To monitor their behavior, the researcher(s) and teacher co-researchers will visit each class after the lunch break and ask them to fill up the form with information about what they have recently consumed. Participant observation strategy will also be used to collect observed data commonly employed in PAR (Baum et al., 2006). Descriptive and critical field notes will be documented each day based on the observation. The researcher(s) act as an instrumental observer to collect the information in the natural setting (Unluer, 2012). During the observation, all the senses of seeing, being, and becoming will be captured, which will be ensured by maintaining field notes (Flick, 2009).

Focused group discussion will be used as the live techniques valuing all participants' divergent viewpoints. All participants have an equal right to view their opinions and counter-opinion during the PAR process (MacDonald, 2012). All the participants involved in the study will be considered active participants throughout the entire research process. The participants' feelings, opinions, ideas, lived experiences, and non-verbal cues will be collected through focus group discussion (FGD). An in-depth interview will be held among the student, teacher, parent and school leaders to uncover the participant's perspectives, opinions, and ideas to explore the lived experiences of co-researchers in the depth of volume to compensate for the data collected via FGD (MacDonald, 2012). Further, dialogue conferences, a qualitative method popularly used in PAR, will be used to accept the ideas and arguments of the co-researchers regardless of their position and hierarchy. This method will enable researchers and co-researchers to mutually exchange their ideas and arguments, and lived experiences by stimulating interactions and broadening conversational participation (Ahmad et al., 2016). Dialogue conferences will be held among the students, teachers, parents and school leaders to co-generate context-based best practices to solve their problems. Similarly, anthropometry measurements will also be used to determine the nutritional status of school children. A standard validated weighing machine and measuring tape will be used to measure the weight and height of the students. The nutritional status will be analyzed following the WHO's Anthro plus standards (WHO, 2010). Basic-level science, health education teachers and child club members will be mobilized for anthropometry measurements after being involved in a school orientation training program.

Under the ostensive techniques, stills presentations like power-point and photographs will be collected. Similarly, audiotapes and videotapes will be taken to make a consensus with co-researchers. These techniques are considered powerful since it is possible to have a flashback of the nuances of actions using a digital recorder and camera.

Data distillation process

Quantitative data will be analyzed using IBM SPSS Statistics 24. Descriptive analysis (mean, median and standard deviation), bivariate analysis (chi-square test and t-test) and multivariate analysis will be performed to analyse the results based on the nature of the data. We would follow a

multi-stepped procedure of qualitative data analysis. The interpretive phenomenological analysis (IPA) method (Pope & Mays, 2020) will be used to explain a deeper understanding of school stakeholders about how they make sense of their experiences while developing the SBPNEP.

This study will combine various quantitative and qualitative data sources, which helps avoid methodological distortion through data triangulation (Creswel & Poth, 2018). The PAR mix methods intend not only to validate the results and authenticate the objectivity of interpretations but also to justify the rationale of the findings (Finlay, 2006). Finally, the findings of the study will be discussed (intersected, interfaced and inter-counterated) with theoretical backup, particularly the socio-ecological model and transformative learning theory

Validity and rigor of the study

In PAR, 'truth' is rooted in a particular context (Unluer, 2012). PAR offers no adaptation of any tailor-made tool and method that is ever prepared for another context. The validity and reliability of quantitative tools will be ensured with multiple methods. The face validity of the tool will be maintained by linking with research questions and related literature review followed by a pre-test. Based on the results obtained from the pre-test, tools will necessarily be modified. Necessary experts' consultations will also be seeking to strengthen the validity of the tools. Similarly, Cronbach's score will also be calculated to ascertain the reliability of the questionnaire's items. The questions will be adjusted based on Cronbach's score.

Reliability and validity criteria in qualitative research are measured as trustworthiness or rigour, namely credibility, transferability, dependability and conformability (Creswell & Miller, 2000; Lincoln & Denzin, 2005). Several measures will be employed to increase the rigour of this study. Credibility, transferability, dependability, and confirmability will be ensured by prolonged field engagement, possibly three consecutive academic years, thick description of writings, triangulation of data, and through reflexive writing (Doyle et al., 2016) respectively.

Table 1. *Methods Used to Ensure the Quality and Trustworthiness of the Study*

Criteria	Methods to ensure the quality
Credibility (Truth value)	Immersion in the field through prolonged field engagement Work with school stakeholders through collaborative action inquiry Involve co-researchers in member checking
Transferability (Applicability)	Provide an in-depth description of the research context in the writing Involve co-researchers based on the purpose of the study
Dependability (Consistency)	Triangulate the data from interviews and focus groups with field notes Ensure transparency in the analysis and write up
Conformability (Neutrality)	Include data from multiple methods: interviews, focus group discussions, observational field notes Demonstrate critical reflection and self-reflexivity throughout all phases of the project interactions and publications

Role of the researcher(s)

The research questions of this study open up the avenue of epistemic integrity of research methods, which allows divergent multi-paradigmatic lenses (Taylor, 2008; Taylor & Medina, 2013). Based on the complexity of research questions, the role of the researcher(s) will begin with the post-positivist lens by scientifically observing the fact and situation and with the help of a structured questionnaire allowing a little space for interaction with research participants during needs assessment (baseline) and outcomes (end-line) study. But, the role of the researcher(s) will switch towards a subjectivistic researcher (interpretivism) to understand the lived experiences while exploring more about the historical, socio-political, educational, and value systems of co-researchers. Moreover, a pragmatist world view will be portrayed while co-working with co-researchers at the time of implementation of interventional activities, whilst the critical lens is a must to analyse the situation with a divergent perspective from the beginning to the end of the study (McNiff & Whitehead, 2006). Thus, the role of the researcher(s) will be dynamic.

Ethical consideration

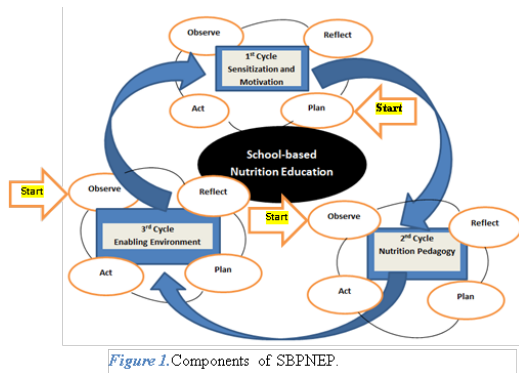
This study has received an ethical approval clearance letter from the Ethical Review Board of the Nepal Health Research Council (NHRC). Winter (1987) outlines several ethical principles that PAR researchers should follow. To respect an individual's autonomy, informed consent will be obtained from parents or/and legal guardians, whilst children will orally assent before being involved in the study. We will ensure the voluntary involvement of participants by offering any time withdrawal option if they do not wish to become a part of the study. The teachers, students and other school stakeholders are always free to share their experiences in the natural setting of the environment.

Since this study is approached by PAR, the participants involved in the study, will not just act as an information provider, rather become an active co-researcher. Thus, this study will preserve the principle of beneficence or non-maleficence by engaging ourselves in classroom teaching in collaboration with the teachers. Moreover, extended field engagement minimizes the power hierarchy between the researcher (s) and co-researchers. This study will respect the socio-cultural competencies, values, norms, way of living, knowledge democracy, and the autonomy of the co-researchers.

Intervention Components Used in the PAR Cycles

Based on the theoretical constructs of the nutrition education model (Contento, 2011), this study aims to design, implement, and evaluate SBPNEP. Contento (2011) theorizes integrated nutrition education as an effective means to promote the nutritional behavior of schoolchildren if it is designed with three interconnected components (phases) such as motivation, action, and supportive environment. These all are implemented following the PAR approach. This study uses the socio-ecological model as explained by Bronfenbrenner (1979) and McLeroy et al. (1988) to design, implement and evaluate the SBNE. The intervention will be designed, implemented and evaluated in collaboration with co-researchers through three PAR cycles. Each cycle will proceed according to four interlinked components: plan, act, observe, and reflect. This is also called an action-reflection cycle—a praxis model (McNiff & Whitehead, 2006).

The intervention cycles begin with 'motivation and sensitization cycle' followed by 'pedagogy' and 'advocacy and policy cycle'. Cycle-I leads to cycle-II, and cycle-II leads to cycle-III (fig.1).



Cycle-I: Motivation/sensitization cycle

This is the first cycle of intervention, which is targeted at increasing awareness and sensitization level among the students, teachers, and school leaders about school meal consumption behaviors of students and their subsequent consequences. Drama exhibition, nutrition fair, commitment session, school assembly nutrition message, audio-visual presentations, and home visits are conducted to increase awareness level and sensitize the co-researchers regarding the potential effects of unhealthy school meals behaviors of children. It is stipulated that this cycle would develop a strong intention (self-efficacy) for behavior change. Further, these activities stimulate both students and stakeholders breaking up their quo-status through initiative roles and preparing them for the next cycle. We co-design the first PAR cycle-related action activities within a trimester.

Cycle-II: Pedagogy cycle

The nutrition pedagogy cycle further consists of contextualising the nutrition education curricula, developing of teaching learning resources, developing the sessions plans, teachers' professional development (TPD) for pedagogy sessions, and classroom-based nutrition education pedagogy. The basic school nutrition education curriculum will be reviewed in collaboration with science and health education teachers. Participatory workshops and dialogue conferences will empower the teachers to contextualize the curriculum, develop teaching-learning resources, develop lesson studies, and implement them (Ahmad et al., 2016). Nutrition pedagogy sessions will be implemented in two phases. In the beginning, the sessions will be implemented for grades 1-5 and 6-8 in the second phase. It is anticipated to complete the second cycle-related intervention activities within six months.

Cycle-III: Creating a supportive environment for sustainability

This is the third PAR cycle. Teachers and school leaders will act as role models, followed by advocacy and lobbying sessions for developing school health and nutrition policy and program to sustain the change among the students brought by sensitization/motivation and pedagogy cycles. The social-ecological model (SEM) theorizes that unless the supporting environment is developed, the newly adopted behaviors may not sustain longer (McLeroy et al., 1988).

Therefore, this cycle will substantially impact sustaining the changes in the nutrition behaviors of students. We will collaborate with school leaders and local government to develop and implement school health and nutrition policy and program. Advocacy sessions will be organized to mobilise local, provincial and federal-level nutrition experts and social activists. This cycle's focus is to scaffold students' changed behaviours by creating a supportive school environment (Contento, 2008). We anticipate completing third cycle-related session activities within a year. But due to the unprecedented conditions created by the COVID-19 pandemic, the study duration will extend longer.

Evaluation of the PAR Cycles

Short-term outcomes of the intervention will be measured once each PAR cycle gets over. Midterm outcomes will be evaluated after six months from the time of completion of the cycle and final outcome evaluation will be conducted at the end of the PhD project. For that, an end-line study will be conducted. Outcome evaluation will be undertaken to determine the effectiveness of the study comparing the baseline results with the end-line. Once each PAR cycle gets over, interactive discussions will be held with co-researchers to analyze the effectiveness of the intervention. This kind of interaction allows critical reflection upon the action and lesson learned for the next cycle. The effectiveness of the program will be evaluated based on the theoretical assumption of the logic frame model as depicted in figure 2 (Contento, 2011).

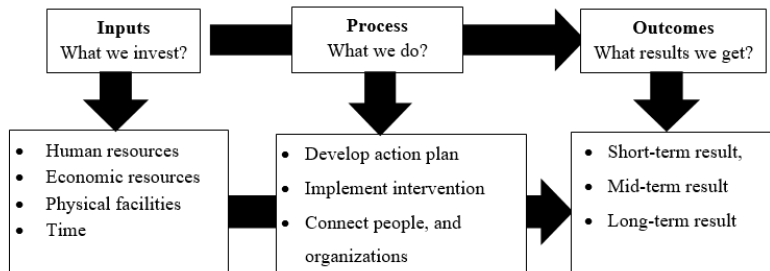


Figure 2. *Logical Framework Model*

Dissemination of the Study Results

Since this study is a supervised doctoral study granted by the NORHED Rupantaran Research Project led by the Faculty of Education, TU; the results of this study will be used more than achieving a doctoral degree. The progress and findings of the study will be communicated among the school stakeholders (co-researchers) and the local community through face-to-face gatherings at school, virtual forums, and social and local media. Moreover, the study's findings will be disseminated by scientific publications, national and international symposiums, conferences, workshops, and colloquiums over the period. This study also aims to develop a school-based nutrition education lesson study manual book, which further provides a guideline to implement contextualized nutrition education to promote healthy nutritional behaviors in school children. Moreover, meetings and presentation sessions will also be held with the Curriculum Development Centre and Ministry of Education, Science and Technology advocating the implementation of successful stories of this study.

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Competing Interests

The authors declare no potential conflicts of interest concerning this study, authorship, and/or publication.

Contributors

YRU, a PhD fellow researcher of NORHED Rupantaran TU, developed the study protocol. BD, the supervisor of this study, edited the manuscript thoroughly with critical inputs for finalizing a manuscript of this kind. Both authors have read and approved the final manuscript for publication and authorship.

Ethical Approval

The research protocol for the study was approved by the Faculty of Education, TU. Further, the ethical approval for the study was obtained from the Nepal Health Research Council [NHRC] reference no. 733/2018.

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