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Educational intervention on knowledge and self-efficacy towards reducing over nutrition among school-going adolescents of Kawasoti municipality

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ABSTRACT

Background: Overnutrition among adolescents is a global concern with unhealthy habits and sedentary lifestyles contributing to health complications such as obesity. Addressing overnutrition during adolescence is crucial, as it can persist into adulthood, posing long-term health risks. Recognizing the well-established efficacy of educational interventions in fostering positive health behaviours.

Objectives: This study aimed to evaluate the impact of an educational intervention on enhancing knowledge and self-efficacy concerning overnutrition among school-aged adolescents in Kawasoti Municipality.

Methods: A prospective quasi-experimental design model was employed with a pre-test/post-test control group for this study. Two public schools in Kawasoti Municipality were purposively selected with one school designated as the intervention group and the other as the control group. School-aged adolescents (12 to 16 years) studying in grades 9 and 10 were enrolled. The intervention package comprised interactive sessions, mini-lectures, videos, demonstrations, and distribution of educational materials targeting overnutrition awareness, healthy eating habits, and physical activity promotion. The intervention was delivered to the designated intervention school over a one-month period.

Results: The intervention significantly enhanced knowledge levels in the intervention group. Post-test results showed a higher mean (15.83) of participants with high knowledge score in the intervention group. The intervention boosted self-efficacy in healthy eating and physical activity with the intervention group (mean self-efficacy score=19.69) displaying significantly higher levels than the control group (mean self-efficacy score=16.50) which were statistically significant. Statistically significant positive correlations were found between knowledge, healthy eating self-efficacy ($r=0.59$, $P<0.05$) in intervention group and physical activity self-efficacy were evident in both groups ($r=0.85$, $P<0.05$ in control group, $r=0.42$, $P<0.05$ in control group).

Conclusion: The study demonstrated that interventions in Kawasoti Municipality helped adolescents gain knowledge, self-confidence, and healthier habits. Future interventions should be comprehensive, focused, and collaborative to effectively address teenage overnutrition.

Keywords: Educational intervention, Healthy eating self-efficacy, Knowledge, Overnutrition, Physical activity, Self-efficacy

1. Introduction

The World Health Organization (WHO) labelled obesity as a 'Global Pandemic' after it ranked as the fifth most common cause of mortality among human beings [1]. Overweight and obesity are associated with a significant number of diabetes cases, heart diseases and various malignant cancers [2]. In Nepal, the prevalence rates of overweight and obesity among adolescents vary across regions, with some areas reporting rates are as high as 25.9% [2,3]. Overnutrition is not only impacting physical health but also posing psychological and academic challenges for adolescents [4]. It has been concluded that the reason for the sudden increase of obesity is related with the changes in dietary patterns and the urbanization [5]. Overnutrition is affecting the current health of people and also has long-term implications. Children who are overweight or obese are more likely to become obese adults and face an increased risk of developing non-communicable diseases at a younger age [3]. It is a global health concern affecting both high-income and low- and middle -income countries with more than 1.9 billion adults and over 340 million children and adolescents worldwide being overweight or obese [6]. This epidemic of overnutrition has significant economic and social costs, including increased healthcare expenses and reduced productivity. Moreover, childhood obesity is attributed to a lack of awareness and the prevalence of misinformation and false beliefs regarding nutrition [7]. Childhood obesity has also been associated with chronic diseases such as diabetes, hypertension, respiratory disorders, and orthopaedic conditions [8]. Several studies have found a strong association between overnutrition and psychological distress, including depression, anxiety, and social hindrances which directly impact students' personal and professional lives [9–11]. In order to combat overnutrition among adolescents, educational interventions play a crucial role in improving knowledge and self-efficacy related to healthy behaviours. The Social Cognitive Theory suggests that individuals' behaviours are influenced by their knowledge, attitudes, and self-efficacy [12]. Previous studies have demonstrated the effectiveness of educational interventions in promoting positive health behaviour changes among adolescents [13,14]. Lifelong nutritional patterns are established during an individual's formative years and tend to persist over time. School-aged children are at an increased risk of developing poor dietary habits, such as skipping breakfast due to early

morning classes, consuming inadequate amounts of fruits and vegetables, eating unhealthy snacks, and engaging in low levels of physical activity [15,16]. Therefore, it is essential to acknowledge and address the importance of prevention and health promotion in lowering disease prevalence [17]. Creating an effective healthy lifestyle program integrated with school education for adolescent children can enhance health literacy which is essential for preventing this public health issue among young children. Despite the significance of educational interventions, such studies focusing on overweight and obesity among adolescents in Nepal are limited. Most of the assessments rely upon BMI alone, neglecting other types of anthropometric measurements, and comprehensive individual-level support for adolescent health [18]. Therefore, this study aimed to investigate the effectiveness of an educational intervention in improving knowledge, self-efficacy and finding the correlation between Knowledge, Healthy Eating Self Efficacy and Physical Activity Self efficacy related to overnutrition. By evaluating the baseline knowledge and self-efficacy levels and assessing the impact of the educational intervention, this research will contribute valuable insights into the promotion of healthy eating habits and physical activity among the target population.

2. Methods

2.1 Study Area

The study was carried out in secondary-level schools of Kawasoti Municipality, Nawalparasi East, Gandaki Province.

2.2 Study Design

The study employed a quasi-experimental (pre-test post-test, control group design with equivalent groups) to assess the effectiveness of an educational intervention on knowledge and self-efficacy towards reducing over-nutrition among school-going adolescents in Kawasoti Municipality.

2.3 Sample size and sampling

The sample size for comparing two means was determined using the online software (OpenEpi - Toolkit Shell for Developing New Applications, 2023). The analysis was conducted with a 95% confidence interval and 80% power. The formula used for calculating the sample size was as follows:

$$n_1 = \frac{(\frac{\sigma_1^2+\sigma_2^2}{\kappa})(Z_{1-\alpha/2} + Z_{1-\beta})^2}{\Delta^2}$$

$$n_2 = \frac{(\kappa * \sigma_1^2 + \sigma_2^2)(Z_{1-\alpha/2} + Z_{1-\beta})^2}{\Delta^2}$$

Where,

$n_1 =$ sample size of Group 1

$n_2 =$ sample size of Group 2

$\sigma_1 =$ standard deviation of Group 1

$\sigma_2 =$ standard deviation of Group 2

$\Delta =$ difference in group means $(\mu_1 - \mu_2)$

$\kappa =$ ratio $= n_1/n_2$

$Z_{1-\alpha/2} =$ two $-$ sided Z value (eg. Z $=$ 1.96 for 95% confidence interval)

$Z_{1-\beta} =$ power

Using the above formula and assuming the mean and standard deviation of the control and intervention groups as (5.21 ± 1.21, 6.07 ± 1.28) from a previous interventional study conducted among adolescents in selected schools in Eastern India [20], a sample size of 66 was obtained with a 95% confidence interval and 80% power, and a ratio of 1:1 between the intervention and control groups. Therefore, the sample size determined from the formula is 66, with 33 participants allocated to each group.

Lastly, adding 20% attrition rate, we obtained a sample size $(n) = \frac{n_0}{(1-20\%)}$

$n = \frac{66}{(1-20\%)} = 82.5 \sim 84$

Finally, a total sample size of 84 was obtained.

Two government schools were purposively selected, with one designated as the intervention and the other as control group. The study population consisted of adolescents aged 12 to 16 studying in grade 9 and 10. Students who were absent on the day of the pre-test, intervention, or post-test, as well as those who refused to participate in the study, were excluded from the study. A sample size of 84 participants was determined using non-probability purposive sampling. Pre-tests and post-tests were conducted to assess knowledge and self-efficacy levels and evaluate the impact of the educational intervention.

2.4 Data Collection

Data was collected using self-administered questionnaires developed based on the constructs of Social Cognitive Theory. The educational intervention package was developed through a comprehensive process, including a literature review, formative research, and pilot testing. It included interactive sessions, mini-lectures, videos, demonstrations, and distribution of educational materials.

2.4.1 Development and implementation of intervention

The development and implementation of the educational intervention package for reducing overnutrition among school-going adolescents involved a comprehensive approach and took about two months. Firstly, a thorough review of existing literature on health education interventions, focusing on overnutrition, was conducted. This was followed by formative research to gather valuable insights into the knowledge and self-efficacy levels of the target population. Based on the literature review and formative research findings, an intervention framework was developed.

The Healthy Eating Self-Efficacy Score (HESES) and Physical Activity Self-Efficacy Score (PASES) were developed through an extensive process. This involved a thorough review of existing literature, consultation with experts, and pretesting of the tools to enhance their validity and reliability.

The content of the educational intervention package was then carefully developed, incorporating various elements such as PowerPoint slide presentations, mini-lectures, video shows, infographics, demonstrations, and interactive activities, all designed to cater to the specific needs of adolescents. After two weeks, a pilot test was conducted with a small group of adolescents to assess the feasibility, acceptability, and effectiveness of the package, and participant feedback was used to refine it.

The final educational intervention package was then implemented in three sessions, each lasting approximately three hours, with a focus on conveying information about overnutrition, healthy eating habits, and the importance of physical activity. The intervention involved interactive elements to engage the participants actively. The educational materials were distributed at the end of each session.

The validation of the educational intervention package included assessing face validity through external feedback and content validity through expert consultation. The package was validated to ensure its relevance and appropriateness for the target population of school-going adolescents.

2.5 Data Analysis

The data was entered into Epi-Data version 3.1 and was subsequently exported to the Statistical Package for the Social Sciences for further analysis. In accordance with the study's objectives, the data was transformed and computed using SPSS version 20. A

paired *t-test* was performed to compare the mean HESES (Healthy Eating Self Efficiency Score) and PASES (Physical Activity Self Efficiency Score) scores at pre-test and after the intervention at post-test in both the control and intervention groups. Furthermore, a correlation analysis was conducted to determine the association between knowledge, healthy eating self-efficacy, and physical activity self-efficacy.

2.6 Ethical Clearance

The study was conducted after obtaining approval from the Public Health Program, School of Health and Allied Sciences, Pokhara University. Ethical approval was obtained from the Institutional Review Committee (IRC) of Pokhara University (Ref 135-079/80). Permission was sought from Kawasoti Municipality and the respective schools. The purpose of the study was explained, and written assent from adolescents and written consent from their parents/guardians were obtained before the beginning of the study.

3. Results

There was a total of 42 participants in each group. In terms of age distribution, the majority of participants in both groups were less than 14 years old with 52% in the control group and 64% in the intervention group falling into this category. The mean age was similar in both groups with the control group having a mean age of 14.43 years and the intervention group having a mean age of 14.36 years. In terms of sex, the proportion of males was slightly higher in the intervention group (57%) compared to the control group (48%).

The majority of participants in both groups belonged to the Hindu religion, with 90% in the control group and 90% in the intervention group. In terms of ethnicity, the intervention group had a higher percentage of Janajati participants (62%) compared to the control group (40%).

Regarding education, a higher proportion of participants in the intervention group were in class 9 (69%) compared to the control group (55%). Father's education levels varied with 19% in the intervention group and 26% in the control group having primary education. Mother's occupation showed that 52% of the intervention group were homemakers, while 55% of the control group were involved in agriculture. The majority of participants in both groups were married, with 95% in the control group and 93% in the intervention group (Table 1).

Table 1: Socio-demographic characteristics of participants at baseline

Characteristics	Control (n=42)	Intervention (n=42)
Age		
Less than 14	22 (52%)	27 (64%)
14 years and above	20 (48%)	15 (36%)
Mean age ± SD	14.43 ± 1.19	14.36 ± 0.791
Sex		
Female	22 (52%)	18 (43%)
Male	20 (48%)	24 (57%)
Education		
Class 9	23 (55%)	29 (69%)
Class 10	19 (45%)	13 (31%)
Religion		
Hindu	38 (90%)	38 (90%)
Buddhist	0 (0%)	1 (3%)
Christian	4 (10%)	3 (7%)
Ethnicity		
Dalit	9 (21%)	8 (19%)
Janajati	17 (40%)	26 (62%)
Brahmin/Chhetri	16 (38%)	8 (19%)
Mother's education		
Illiterate	5 (12%)	13 (31%)
Literate	13 (31%)	14 (33%)
Primary	7 (17%)	6 (14%)
Secondary	13 (31%)	5 (12%)
Higher Secondary	3 (7%)	4 (10%)
Undergraduate	1 (2%)	0 (0%)
Father's education		
Illiterate	0 (0%)	8 (19%)
Literate	8 (19%)	7 (17%)
Primary	11 (26%)	11 (26%)
Secondary	15 (36%)	12 (29%)
Higher Secondary	6 (14%)	0 (0%)
Undergraduate	0 (0%)	1 (2%)
Mother's occupation		
Service	5 (12%)	0 (0%)
Foreign employment	1 (2%)	2 (5%)
Agriculture	23 (55%)	15 (36%)
Daily Labour	1 (2%)	1 (2%)
Business	5 (12%)	2 (5%)
Homemaker	7 (17%)	22 (52%)
Father's occupation		
Service	5 (12%)	7 (17%)
Foreign employment	28 (67%)	15 (36%)
Agriculture	2 (5%)	6 (14%)
Daily Labour	1 (2%)	4 (10%)
Business	1 (2%)	5 (12%)
Unemployed	3 (7%)	0 (0%)
Marital Status		
Married	40 (95%)	39 (93%)
Separated	0 (0%)	1 (2%)
Single mother	2 (5%)	2 (5%)
No of brothers		
Median (Min: Max)	1.5 (0:3)	1.5 (0:3)
No of sisters		

Characteristics	Control (n=42)	Intervention (n=42)
Median (Min: Max)	2 (0:4)	1.5 (0:3)
Type of family		
Nuclear	36 (86%)	26 (62%)
Joint	6 (14%)	15 (36%)
Extended	0 (0%)	1 (2%)
Live in		
Own house	41 (98%)	38 (90%)
Rented room	1 (2%)	4 (10%)
International Wealth Index		
Poor	8 (19%)	8 (19%)
Rich	8 (19%)	9 (21%)

At baseline, there were no significant differences in knowledge scores, healthy eating self-efficacy scores, or physical activity self-efficacy scores between the control and intervention groups ($P > 0.05$). This indicates that the two groups were comparable in terms of their baseline levels of knowledge and self-efficacy related to overnutrition.

After the educational intervention, the post-test scores showed significant improvements in the intervention group compared to the control group. For knowledge scores, the mean post-test score in the intervention group was 15.83, which was significantly higher than the control group's mean post-test score of 6.98 ($t = -15.357$, $P < 0.001$). Similarly, for healthy eating self-efficacy scores, the intervention group's mean post-test score was 19.69, significantly higher than the control group's mean post-test score of 16.50 ($t = -5.40$, $P < 0.001$). Additionally, for physical activity self-efficacy scores, the intervention group's mean post-test score was 19.50, significantly higher than the control group's mean post-test score of 16.69 ($t = -4.57$, $P < 0.001$) (Table 2).

Table 2: Comparison of Knowledge mean score, healthy eating self-efficacy and physical activity self-efficacy of Control and Intervention Group at baseline and post test

Factors	Control		Intervention		t	P value
	Mean	SD	Mean	SD		
Mean Knowledge Score at baseline	6.40	2.42	6.36	2.28	0.093	0.926
Mean Knowledge Score at posttest	6.98	1.93	15.83	3.20	-15.357	<0.01*
Mean HESES Score at baseline	6.40	2.42	6.36	2.28	-0.20	0.841
Mean HESES Score at post-test	16.50	2.84	19.69	2.57	-5.40	<0.01*
Mean PASES Score at baseline	17.38	3.38	17.14	2.66	0.36	0.721

Factors	Control		Intervention		t	P value
	Mean	SD	Mean	SD		
Mean PASES Score at post test	16.69	2.90	19.50	2.73	-4.57	<0.01*

The paired t-test was performed to compare the knowledge, healthy eating self-efficacy and physical activity self-efficacy mean score before and after intervention in Intervention group. Before the intervention, the mean knowledge score of the intervention group was 6.36 ± 2.28, the mean HESES score was 17.43 ± 2.79, and the mean PASES score was 17.14 ± 2.65. After the implementation of educational intervention (post-test), there were significant improvements in all three variables compared to baseline. The mean knowledge score increased to 15.83 ± 3.19, the mean HESES score increased to 19.69 ± 2.57, and the mean PASES score increased to 19.50 ± 2.73.

The mean difference between baseline and post-test scores was calculated to evaluate the change due to the intervention. For knowledge scores, there was a substantial increase of 9.48 points (t = -18.52, P < 0.001). For healthy eating self-efficacy scores, the mean difference was 2.26 points (t = -4.89, P < 0.001). Lastly, for physical activity self-efficacy scores, the mean difference was 2.36 points (t = -3.94, P < 0.001). The results indicate that the educational intervention had a significant positive impact on knowledge related to overnutrition, healthy eating self-efficacy, and physical activity self-efficacy among the participants in the intervention group. The participants showed significant improvement in their knowledge and confidence in adopting healthier eating habits and engaging in physical activity after receiving the intervention. These findings highlight the effectiveness of educational intervention in promoting positive behavioral changes related to overnutrition among the intervention group participants (Table 3).

Table 3: Comparison of Knowledge, healthy eating self-efficacy and physical activity self-efficacy Mean score before and after intervention in Intervention group

Variables	Baseline	Post test	Mean difference	95% CI	t	P-value
	Mean ± SD	Mean ± SD				
Mean Knowledge Score	6.36 ± 2.28	15.83 ± 3.19	-9.48	-10.32to -8.64	-18.52	<0.01*
Mean HESES Score	17.43±2.79	19.69±2.57	-2.26	-3.07 to -1.45	-4.89	<0.01*
Mean PASES Score	17.14±2.65	19.50±2.73	-2.36	-3.17 to -1.55	-3.94	<0.01*

In the control group, at baseline, there was a weak positive correlation between knowledge and healthy eating self-efficacy (r = 0.13, P < 0.001), and a moderate positive correlation between knowledge and physical activity self-efficacy (r = 0.47, P < 0.001). However, after the intervention, the correlation between knowledge and healthy eating self-efficacy was not statistically significant (r = 0.15, P > 0.05), while the correlation between knowledge and physical activity self-efficacy remained strong and significant (r = 0.85, P < 0.001).

In the intervention group, at baseline, there was a very weak positive correlation between knowledge and healthy eating self-efficacy (r = 0.05, P < 0.001), and a moderate positive correlation between healthy eating self-efficacy and physical activity self-efficacy (r = 0.62, P < 0.001). There was also a weak negative correlation between knowledge and physical activity self-efficacy (r = -0.22, P < 0.001). After the intervention, the correlation between knowledge and healthy eating self-efficacy became strong and significant (r = 0.59, P < 0.001), as well as the correlation between knowledge and physical activity self-efficacy (r = 0.67, P < 0.001). Additionally, there was a significant positive correlation between healthy eating self-efficacy and physical activity self-efficacy (r = 0.74, P < 0.001) after the intervention (Table 4).

Table 4: Relationship among mean knowledge, HESES and PASES of Control Group and intervention group at baseline and post test

		Baseline			Posttest		
	Variables	1	2	3	1	2	3
Control group	Knowledge	1			1		
	Healthy eating Self-efficacy	0.13 (-0.21,0.47)	1		0.15 (-0.04,0.36)	1	
	Physical Activity Self-Efficacy	0.47** (-0.19,1.13)	0.42** (-0.07,0.91)	1	0.16 (-0.03,0.37)	0.85** (0.66,0.84)	1
		1	2	3	1	2	3
Intervention Group	Knowledge	1			1		
	Healthy eating Self-efficacy	0.05 (-0.19,1.10)	1		0.59** (-0.03, 1.21)	1	
	Physical Activity Self-Efficacy	-0.22 (-0.34,0.06)	0.62** (0.36,0.67)	1	0.67** (0.39,0.69)	0.74** (0.47,0.73)	1

**Correlation significant at 0.01 level (1-tailed)

4. Discussion

The key findings shed light on various aspects of the intervention's impact on the participants. The socio-demographic characteristics of the participants revealed important contextual factors that may

influence their nutrition-related behaviours. The majority of adolescents in both the control and intervention groups had a mean age of 14.41 and 14.40, respectively. This indicates that the study included a representative sample of adolescents within the target age group. The higher proportion of male participants in the intervention group may be attributed to various factors such as differences in participation rates or the distribution of schools within the municipality.

Regarding knowledge levels at baseline, both the control and intervention groups had similar knowledge levels with the majority of participants possessing a moderate level of knowledge. These findings align with previous studies that have reported a moderate level of knowledge among adolescents regarding over nutrition [19,20]. However, it is noteworthy that the intervention group showed a significant increase in knowledge compared to the control group at the post-test stage. This suggests that the educational intervention effectively improved participants' understanding of over nutrition-related concepts. Similar findings have been reported in other studies evaluating educational interventions targeting nutrition knowledge among adolescents [21,22].

The intervention also had a significant positive impact on self-efficacy levels among participants. At the baseline, there were no significant differences in self-efficacy levels between the control and intervention groups. However, at the post-test stage, the intervention group demonstrated significantly higher levels of self-efficacy in both healthy eating and physical activity domains compared to the control group. These findings are consistent with theoretical frameworks such as social cognitive theory which emphasize the role of self-efficacy in influencing behaviour change [23]. Previous studies have shown that educational interventions can effectively enhance self-efficacy among adolescents in adopting healthy eating habits and engaging in physical activity [24].

Furthermore, the correlation analysis revealed interesting relationships between knowledge and self-efficacy variables. At the baseline, a weak positive correlation was observed between physical activity self-efficacy and both knowledge and healthy eating self-efficacy in the control group. This suggests that participants with higher knowledge levels were more likely to have

higher self-efficacy in physical activity and healthy eating domains. At the post-test stage, knowledge showed a weak positive correlation with healthy eating self-efficacy, and healthy eating self-efficacy exhibited a strong positive correlation with physical activity self-efficacy in both the control and intervention groups. These findings indicate the interconnected nature of knowledge and self-efficacy, as individuals with higher knowledge may feel more confident in their abilities to engage in healthy behaviours [25]. While discussing the strengths of the study, this study utilized an educational intervention which is a recognized and effective approach for promoting knowledge and behaviour change among adolescents. The study included both a control group and an intervention group, allowing for a direct comparison of the effects of the educational intervention. The use of validated measures for assessing knowledge and self-efficacy enhances the reliability and validity of the findings. The study incorporated a pre-test and post-test design, enabling the evaluation of changes in knowledge and self-efficacy over time. While there are some limitations, the reliance on self-report measures may introduce response biases, as participants may provide answers they perceive. The lack of long-term follow-up limits the understanding of the sustained impact of the intervention on knowledge and behaviour change.

The study contributes new knowledge by demonstrating the significant impact of educational interventions on improving knowledge and self-efficacy related to overnutrition among adolescents in the SEAR region, particularly in Kawasoti Municipality. While the increasing prevalence of overnutrition is well-documented, this study provides new insights into how structured, theory-based educational interventions can effectively address this issue in a specific population. The innovation in this study lies in the development and implementation of a comprehensive educational intervention package tailored specifically for adolescents. This package was designed using constructs from Social Cognitive Theory and involved a combination of interactive sessions, mini-lectures, videos, demonstrations, and the distribution of educational materials. This approach is novel in its holistic engagement of adolescents, making the intervention both practical and scalable for similar contexts in the region.

The findings of this study have important implications for addressing overnutrition

among school-going adolescents. The educational intervention was effective in improving knowledge and self-efficacy related to over nutrition among the participants. This highlights the potential of educational programs to enhance awareness and understanding of healthy eating habits and physical activity among adolescents. Future interventions can be built on these findings by incorporating multiple components, targeting specific groups, and fostering collaboration with stakeholders. Long-term follow-up assessments and comparative studies can provide further insights into sustained impact and effective strategies. Ultimately, these efforts can contribute to the development of comprehensive and scalable interventions to reduce over nutrition and promote healthier lifestyles among school-going adolescents.

5. Conclusion

The findings showed that the intervention significantly improved knowledge levels and self-efficacy in the intervention group compared to the control group. Future interventions should consider multiple components, target specific groups, and foster stakeholder collaboration. Long-term follow-up and comparative studies are recommended to assess sustained impact and effective strategies. Implementing evidence-based interventions can contribute to the well-being and health outcomes of school-going adolescents.

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