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The Effect of an Educational Intervention Based on Protection Motivation Theory on the Adoption of Preventive Behaviors against Head Lice Infestation among Female Students

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Abstract

Background: Head lice (pediculosis) is a common public-health problem among school-aged children, especially girls. This study aimed to evaluate the effect of an educational intervention based on Protection Motivation Theory (PMT) on adoption of preventive behaviors against head lice among female elementary-school students.

Materials and Methods: In this quasi-experimental study, 151 female students were assigned to intervention (n = 84) and control (n = 67) groups. Study areas were randomly allocated to intervention or control arms; one elementary school per area was selected and fourth- to sixth-grade students recruited using two-stage cluster sampling. Data were collected with a researcher-developed questionnaire measuring awareness, PMT constructs, and preventive behaviors. Analyses (SPSS v.16) included descriptive statistics, independent and paired t tests, Pearson correlation, and ANCOVA adjusting for baseline values.

Results: A total of 151 female elementary-school students participated (intervention: n = 84; control: n = 67). Baseline scores for awareness, PMT constructs, and preventive behaviors did not differ significantly between groups ($p > 0.05$). Post-intervention, the intervention group showed significantly higher scores across all variables compared with the control group ($p \leq 0.001$). ANCOVA adjusting for baseline confirmed significant effects on perceived susceptibility, perceived severity, self-efficacy, response efficacy, response costs, fear, protection motivation, and preventive behaviors ($p < 0.05$), while the effect on awareness was not significant. PMT constructs were positively correlated with preventive behaviors.

Conclusion: A PMT-based educational intervention effectively improved key cognitive and motivational determinants of behavior and significantly increased the adoption of preventive behaviors against head lice among female elementary-school students, although no significant effect was observed on awareness.

Key Words: Health education, Pediculosis; Prevention; Students; Protection Motivation Theory.

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1- INTRODUCTION

Despite advances in public health and sanitation, pediculosis capitis (head lice infestation) remains a persistent global health concern, affecting the physical and psychological well-being of communities (1). Head lice (Pediculus humanus capitis) are obligate ectoparasites that inhabit the human scalp and feed on blood (2). Although all age groups may be affected, infestation is more prevalent among children, particularly girls, due to closer social interactions and hair-related factors (3).

The prevalence of pediculosis capitis varies widely across regions, with rates reported at 4.8% in the Netherlands, 35% in Brazil, 1.2% in Turkey, 28.8% in Venezuela, and 29.7% in Argentina (4). Similar variation exists across Iran, with prevalence estimates of 13.28% in Qom (5), 13.5% in Hamedan (1), 1.8% in Kerman (1), and 3.2% in North Khorasan (6).

Pediculosis capitis is associated with significant clinical and psychosocial consequences. Infestation commonly leads to pruritus, hypersensitivity reactions, sleep disturbance, and fatigue. Secondary complications, including skin infections, impetigo, and lymphadenopathy, may result from scratching (7). In addition, social stigma can contribute to emotional distress, social withdrawal, and reduced academic performance among affected children.

Preventive behaviors are central to controlling infestation; thus, health education plays a critical role (8). However, knowledge-based approaches alone are often insufficient to achieve sustained behavioral change. Theory-driven interventions are therefore needed to address the cognitive and motivational determinants of behavior.

Protection Motivation Theory (PMT), introduced by Rogers in 1975, provides a robust framework for understanding health-protective behaviors (9). PMT explains behavior through threat appraisal (perceived susceptibility and severity) and coping appraisal (self-efficacy, response efficacy, and response costs), which together shape protection motivation and subsequent action (10).

Late childhood is a critical period for establishing lifelong health behaviors (11, 12). Schools, while facilitating transmission due to close contact, offer an effective setting for structured health education interventions (13). Promoting awareness alongside motivation to adopt preventive practices is essential for effective control of head lice infestation.

Despite the relevance of PMT, evidence on its application in pediculosis prevention among high-risk groups remains limited. Therefore, this study aimed to evaluate the effect of a PMT-based educational intervention on preventive behaviors against head lice infestation among female elementary school students.

2- MATERIALS AND METHODS

2-1. Study Design and Setting

This quasi-experimental study was conducted during the 2023–2024 academic year in Sabzevar, Iran, to evaluate the effect of a Protection Motivation Theory (PMT)-based educational intervention on pediculosis-preventive behaviors among female students in grades 4–6. The study protocol was approved by the Ethics Committee of Sabzevar University of Medical Sciences (IR. MEDSAB. AEC. 1401.089).

2-2. Participants and Sampling

Participants were selected using a two-stage cluster sampling method. The two educational districts in Sabzevar, Iran, were randomly assigned to intervention and control groups, and one elementary school was randomly selected from each

district. Eligible participants were female students in grades 4–6. Inclusion criteria included written informed consent from parents or legal guardians; exclusion criteria were unwillingness to participate and the presence of pre-existing dermatological conditions.

Sample size was calculated based on a previous study (14), assuming a 95% confidence level and 80% power. A minimum of 58 students per group was required; accounting for potential attrition, 151 students were enrolled (intervention: n= 84; control: n = 67).

2-3. Measures

Data were collected before and after the intervention using a validated questionnaire developed by Rezaei et al. (15), with acceptable validity (CVI = 0.90, CVR = 0.80) and reliability (Cronbach's α = 0.75–0.85). The instrument included demographic characteristics, awareness (6 items, scored 0–1), PMT constructs (40 items across perceived susceptibility, perceived severity, self-efficacy, response efficacy, response costs, fear, and protection motivation; 5-point Likert scale), and preventive behaviors (4 items, scored 1–5). Reverse scoring was applied where appropriate.

2-4. Intervention

The PMT-based intervention consisted of four weekly 30-minute sessions delivered through lectures, storytelling, and peer education by the research team in collaboration with school staff. Educational materials were age-appropriate and designed to enhance comprehension. Supplementary pamphlets and posters were distributed to reinforce learning at home and school.

2-5. Statistical Analysis

Data were analyzed using SPSS version 16. Normality was assessed using the Kolmogorov–Smirnov test. Baseline comparisons were conducted using chi-square and independent-samples t-tests. Analysis of covariance (ANCOVA) was applied to evaluate intervention effects while controlling for baseline values. Statistical significance was set at $p < 0.05$.

2-6. Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki (2013 revision) and was approved by the Ethics Committee of Sabzevar University of Medical Sciences (Approval ID: IR.MEDSAB.AEC.1401.089). Prior to participation, written informed consent was obtained from all parents or legal guardians. The study objectives, procedures, and voluntary nature of participation were clearly explained to the participants and their families. Participants were informed of their right to withdraw from the study at any time without any academic penalty or impact on their access to school services.

Confidentiality and anonymity were strictly maintained. All data were coded upon collection, and no personal identifiers were included in the analytical dataset. Access to identifiable data was restricted to the research team and stored in secure, password-protected files.

In accordance with the principle of justice, educational materials developed for the intervention were provided to the control group after study completion to ensure equitable access to health education.

3- RESULTS

A total of 151 female elementary-school students participated (intervention: n = 84; control: n = 67). As shown in **Table 1**, the groups were comparable at baseline in grade level and maternal characteristics ($p>0.05$). However, significant differences were observed in father's occupation ($p= 0.023$), father's educational level ($p= 0.003$), and history of pediculosis infestation ($p=0.001$).

Table 1: Baseline demographic characteristics of participants in the intervention and control groups.

Variables	Category	Intervention (n = 84), n (%)	Control (n = 67), n (%)	P-value
Grade	Fourth	31 (36.9)	15 (22.4)	0.069
	Fifth	23 (27.4)	29 (43.3)	
	Sixth	30 (35.7)	23 (34.3)	
Mother's occupation	Worker	8 (9.5)	7 (10.4)	0.489
	Employee	2 (2.4)	0 (0.0)	
	Freelance	21 (25.0)	13 (19.4)	
	Housekeeper	53 (63.1)	47 (70.1)	
Father's occupation	Worker	30 (35.7)	18 (26.9)	0.023
	Employee	6 (7.1)	0 (0.0)	
	Freelance	42 (50.0)	47 (70.1)	
	Unemployed	6 (7.1)	2 (3.0)	
Mother's education	Illiterate	5 (6.0)	6 (9.0)	0.250
	Primary school	37 (44.0)	38 (56.7)	
	Guidance school	15 (17.9)	10 (14.9)	
	Diploma	23 (27.4)	9 (13.4)	
	University degree	4 (4.8)	4 (6.0)	
Father's education	Illiterate	3 (3.6)	0 (0.0)	0.003
	Primary school	30 (35.7)	43 (64.2)	
	Guidance school	25 (29.8)	15 (22.4)	
	Diploma	20 (23.8)	9 (13.4)	
	University degree	6 (7.1)	0 (0.0)	
History of pediculosis	Yes	46 (54.8)	18 (26.9)	0.001
	No	38 (45.2)	49 (73.1)	

Note: Percentages were calculated within each group.

At baseline, no significant differences were found between groups in awareness, PMT constructs, or preventive behaviors ($p > 0.05$) (**Table 2**). Post-intervention, the intervention group demonstrated significantly higher scores across all variables compared with the control group ($p \leq 0.001$). Within-group analysis showed minimal changes in the control group, with significant increases only in perceived severity ($p = 0.040$) and self-efficacy ($p = 0.045$). In contrast, the intervention group exhibited significant improvements in all PMT constructs and preventive behaviors ($p < 0.001$), except for awareness ($p = 0.190$).

Table-2: Comparison of mean ± SD scores for awareness, PMT constructs, and preventive behaviors before and after the educational intervention.

Variables	Group	Before (Mean ± SD)	After (Mean ± SD)	Within-group p-value	Baseline p-value	Post-intervention p-value
Awareness	Control	3.90 ± 1.40	3.96 ± 1.24	0.509	0.285	0.001
	Intervention	4.12 ± 1.15	4.35 ± 1.21	0.190		
Perceived susceptibility	Control	19.16 ± 3.01	19.04 ± 3.25	0.381	0.279	0.001
	Intervention	18.63 ± 2.97	24.70 ± 2.54	<0.001		
Perceived severity	Control	24.43 ± 4.36	24.27 ± 4.45	0.040	0.316	0.001
	Intervention	23.64 ± 5.10	32.43 ± 5.33	<0.001		
Self-efficacy	Control	17.55 ± 2.65	17.43 ± 2.84	0.045	0.872	0.001
	Intervention	17.62 ± 2.42	23.48 ± 1.78	<0.001		
Response efficacy	Control	17.06 ± 2.61	16.97 ± 2.78	0.321	0.782	0.001
	Intervention	17.18 ± 2.62	22.45 ± 2.63	<0.001		
Response costs	Control	21.66 ± 3.53	21.72 ± 3.46	0.208	0.075	0.001
	Intervention	20.48 ± 4.35	29.05 ± 4.43	<0.001		
Fear	Control	23.69 ± 3.11	23.75 ± 3.09	0.321	0.452	0.001
	Intervention	24.07 ± 3.11	28.98 ± 5.04	<0.001		
Protection motivation	Control	23.51 ± 3.10	23.60 ± 2.98	0.182	0.124	0.001
	Intervention	24.29 ± 3.03	30.90 ± 2.94	<0.001		
Preventive behavior	Control	11.76 ± 1.34	11.88 ± 0.94	0.321	0.104	0.001
	Intervention	12.14 ± 1.48	13.87 ± 1.82	<0.001		

Note. Within-group p-values were calculated using paired-samples t-tests. Baseline and post-intervention between-group comparisons were performed using independent-samples t-tests. PMT: Protection Motivation Theory. SD: Standard Deviation.

ANCOVA controlling for baseline values confirmed significant effects of the intervention on all PMT constructs and preventive behavior, with the largest effect sizes observed for total PMT score (F=644.041, ηp2=0.813), response efficacy (F=437.980, ηp2=0.747), and protection motivation (F=292.796, ηp2=0.664) (**Table 3**). The adjusted effect on awareness was not statistically significant (F=2.575, p=0.111).

Table-3: ANCOVA results for post-intervention outcomes adjusted for baseline values.

Outcome	N	F	df	p-value	Partial ηp2
Awareness	151	2.575	1, 148	0.111	0.017
Perceived susceptibility	151	191.524	1, 148	<0.001	0.564
Perceived severity	151	164.452	1, 148	<0.001	0.526
Response efficacy	151	437.980	1, 148	<0.001	0.747
Self-efficacy	151	222.194	1, 148	<0.001	0.600
Response costs	151	160.621	1, 148	<0.001	0.520
Fear	151	63.142	1, 148	<0.001	0.299
Protection motivation	151	292.796	1, 148	<0.001	0.664
Preventive behavior	151	62.067	1, 148	<0.001	0.295
Total PMT score	151	644.041	1, 148	<0.001	0.813

Note. ANCOVA models were adjusted for baseline values of the corresponding outcome variables.

Pearson's correlation analysis revealed positive associations among PMT constructs at baseline (**Table 4**). The strongest correlation was between perceived susceptibility and perceived severity (r=0.513, p<0.001). Protection motivation was positively correlated with self-efficacy (r=0.366, p<0.001) and response efficacy (r=0.336, p<0.001), while preventive behavior was positively associated with protection motivation (r=0.261, p<0.01).

Table-4: Pearson correlation matrix of awareness, PMT constructs, and preventive behavior before the intervention (n=151).

Variables	1	2	3	4	5	6	7	8	9
1. Awareness	1								
2. Perceived susceptibility	0.162*	1							
3. Perceived severity	0.138	0.513***	1						

Variables	1	2	3	4	5	6	7	8	9
4. Self-efficacy	0.139	0.138	0.375***	1					
5. Response efficacy	0.278***	0.225**	0.433***	0.454***	1				
6. Response costs	0.019	0.121	0.143	0.228**	0.193*	1			
7. Fear	0.115	0.130	0.277***	0.204*	0.162*	-0.019	1		
8. Protection motivation	0.112	0.277***	0.304***	0.366***	0.336***	0.081	0.150	1	
9. Preventive behavior	0.037	0.133	0.070	0.115	0.192*	0.177*	0.128	0.261**	1

Note. Values represent Pearson correlation coefficients (r); All tests were two-tailed. *p<0.05, **p<0.01, ***p<0.001.

4- DISCUSSION

This study examined the effect of a Protection Motivation Theory (PMT)-based educational intervention on preventive behaviors against head lice infestation among female elementary-school students. The findings showed that the intervention significantly improved PMT constructs and preventive behavior, while the adjusted effect on awareness was not significant. This indicates that knowledge alone is insufficient for sustained behavior change and that deeper motivational and cognitive factors are required to promote preventive practices (13,15,18).

At baseline, awareness was relatively low, which is consistent with previous studies showing a substantial burden of pediculosis among schoolgirls in Iran and related gaps in preventive knowledge and behavior (1, 3, 4-7,16). Previous epidemiologic studies have also reported that head lice infestation remains common in primary school girls and is associated with behavioral and contextual factors (1, 3, 5-7). These findings support the need for school-based interventions that go beyond simple information delivery.

The intervention significantly improved perceived susceptibility and perceived severity. This suggests that students developed a more realistic understanding of both their risk of infestation and the seriousness of pediculosis. In PMT, these constructs form the core of threat appraisal and are expected to influence motivation for protective action (19, 20, 24). Similar results have been reported in other PMT-based health education studies, where strengthening threat appraisal led to improved preventive practices (17, 19, 20).

Self-efficacy and response efficacy also increased significantly after the intervention. This finding is important because coping appraisal is central to the adoption of protective behavior. When students believe they can perform preventive actions and that those actions are effective, they are more likely to engage in them (21-23). Prior PMT-based studies in other health areas, as well as in pediculosis prevention, have similarly shown that self-efficacy and response efficacy are key determinants of behavior change (13, 15, 18, 21-23).

The increase in response costs should not necessarily be viewed as unfavorable. Rather, it may reflect a more realistic

evaluation of the effort required for prevention compared with the burden of infestation. PMT suggests that behavior is more likely when individuals perceive the costs of inaction to be greater than the costs of preventive action (17, 19, 23). In addition, the increase in fear is consistent with PMT-based interventions showing that fear can support behavioral change when it is paired with strong efficacy beliefs (19, 20, 24).

Most importantly, the intervention increased protection motivation and preventive behavior. This supports the central assumption of PMT that behavior change occurs when threat appraisal and coping appraisal operate together effectively (15, 17-23). The positive correlations among PMT constructs and preventive behavior further reinforce the theoretical coherence of the model and are consistent with previous studies of school-based pediculosis prevention and other PMT interventions (13-15, 17, 19, 21, 23).

4-1. Study Limitations

This study has several limitations. First, the sample was drawn from only two schools in Sabzevar, which may limit the generalizability of the findings to other regions with different cultural and socioeconomic contexts. Second, because pediculosis is a stigmatized condition, self-reported responses may have been influenced by social desirability bias despite the confidentiality measures implemented. Third, the study included only female students; therefore, the findings cannot be generalized to male students. Finally, the perceived rewards construct of Protection Motivation Theory (PMT) was not assessed, although it is an important theoretical variable that should be considered in future research.

5- CONCLUSION

Overall, the findings of this study indicate that a PMT-based educational intervention was effective in improving the cognitive and motivational determinants of preventive behavior and in increasing preventive practices against head lice infestation among female elementary-school students. Although awareness is an important initial step, the results suggest that behavior change is more strongly influenced by threat appraisal and coping appraisal constructs, particularly self-efficacy, response efficacy, and protection motivation. These findings are consistent with previous PMT-based interventions on pediculosis and other health-related behaviors, supporting the value of theory-driven educational programs in school settings. Given the accessibility, low cost, and scalability of school-based interventions, integrating PMT-informed health education into elementary school curricula may be an effective strategy for promoting sustainable prevention of head lice infestation.

6- AUTHORS' CONTRIBUTIONS

Study conception or design: MH, MA; Data analyzing and draft manuscript preparation: RH, AM, RS, HJ, DM, AT, and MV; Critical revision of the paper: MH; Supervision of the research: MH and MA; Final approval of the version to be published: MH, RH, AM, RS, HJ, DM, AT, MV, and MA.

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8- CONFLICT OF INTEREST: None.

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