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Unveiling Parental Knowledge, Attitudes, and Practices on Intestinal Parasitic Infections in Lahore, Pakistan

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ABSTRACT

Intestinal Parasitic Infections are intestinal infections, especially in toddlers, caused by parasites such as worms. **Objectives:** To explore Knowledge, Attitudes, and Practices of Intestinal Parasitic Infections in Pakistan, emphasizing their interlinkage with other socio-demographic factors. **Methods:** This cross-sectional study was conducted in Pak town, Lahore, on 348 parents. A questionnaire was developed to record demographic data, five Knowledge items, seven Attitudes, and 12 Practice questions. IBM SPSS version 27 was used for all the analyses. Descriptive, chi-square and binary logistic regression analyses were applied. **Results:** The majority of participants were housewives (50.9%). The levels of Knowledge, Attitude, and Practices were poor in 56%, 60.9%, and 51.7% of the parents, respectively. There was a greater likelihood of good attitude in parents with good knowledge (adjusted OR=5.3; 95% CI=0.3-96.4) compared with poor knowledge. Male were less likely (adjusted OR=0.3; 95% CI=0.1-0.7) to present good attitudes than female. Parents with education level of Intermediate (adjusted OR=2.6; 95% CI=1.2-5.7), Graduate (adjusted OR=3.5; 95% CI=1.6-7.6), and Masters (adjusted OR=60.8; 95% CI=3.8-974.3) showed better attitudes than those with secondary education. Good practices were associated with the presence of good attitudes rather than poor attitudes (adjusted OR=0.6; 95% CI=0.4-0.9). **Conclusions:** It was concluded that there was a poor prevalence of Knowledge, Attitudes, and Practices in Punjab. Good knowledge determines good attitudes that control good practices; hence, a focus on augmenting Practices of Intestinal Parasitic knowledge among parents should be the top priority of healthcare, especially among mothers.

INTRODUCTION

Intestinal parasitic infections (IPIs) are a significant contributor to illnesses globally and have been identified as a notable public health issue [1]. Soil-transmitted helminthiasis and schistosomiasis pose significant risks to an estimated population of one billion [2]. The World Health Organization (WHO) reports that the most prevalent species are Ascaris Lumbricoides, Trichuris Trichiura and hookworms [3]. In 2022, almost 740 million people will be infected with hookworms, as per the reports of the Centers for Disease Control and Prevention. A significant proportion of these infections affect children, with an estimated 880 million children requiring a cure for intestinal helminths [4]. Although preventable, IPI persists due to gaps in parental Knowledge, Attitudes, and Practices (KAP). Most parasitic infections are transmitted through the Fecal-oral route, emphasizing the importance of proper sanitation and hygiene practices. These infections disproportionately affect impoverished communities and are closely linked to factors such as poverty, inadequate housing, lack of clean water, sanitation, access to healthcare, education, and socioeconomic disparities [5, 6]. In underdeveloped

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nations, impoverished populations face a cycle of malnutrition and recurrent infections, leading to increased morbidity [7]. In Pakistan, like other Low and Middle-Income Countries (LMICs), the impact of IPIs is profound, especially in rural areas, where poverty, lack of education, limited access to healthcare, and poor sanitation exacerbate the problem. For example, in Mandi Bahauddin, research revealed that over 33% of schoolchildren were infected with intestinal parasites [8]. Gilgit-Baltistan reported an infestation rate of 51.5% among gastrointestinal patients with Ascaris lumbricoides and Giardia lamblia [9]. The use of contaminated glacial water for drinking and agriculture has aggravated the spread of these infections. Parents play a pivotal role in safeguarding their children's health and well-being. They serve as primary caregivers and decision-makers regarding healthcare practices within the household. The KAP model allows researchers to capture comprehensive insights into parental awareness, beliefs, and behaviours, which are key factors in controlling and preventing infections. There is a need for this framework in Lahore because IPIs are prevalent and are often linked to inadequate awareness, cultural beliefs, and suboptimal hygiene practices. By applying the KAP framework, this study identifies specific knowledge gaps, misconceptions, and behavioural patterns that may contribute to the spread of IPI. Understanding parental Knowledge, Attitudes, and Practices (KAP) regarding intestinal parasitic infestation is crucial for designing effective interventions aimed at the prevention, early detection, and treatment among South Asian children. Understanding the interplay between knowledge, attitudes, and practices is crucial for the development of evidence-based strategies to reduce healthcare burden.

This study aims to inform the design and implementation of targeted interventions aimed at reducing adverse IPI outcomes.

METHODS

The observational community-based cross-sectional study was carried out from June 2024 to September 2024 in Pak Town, a randomly selected urban union council of Lahore, Punjab Pakistan. The study population was parents of children infected with intestinal parasites. The sample size was 348, calculated using a simple random sampling technique and formula [n=Z2α/2*(P(1-P)/d2]. The population proportion used for calculation was (p=52.3%) with a 10% non-response rate, 95% confidence interval (CI), and 5% margin of error [10]. Parents living in Pak town for at least 6 months with children aged 2 to 6 years were included. Parents of children who were seriously ill and had undergone standard intestinal treatment for parasites in the last 6 months were excluded. A structured interview-based questionnaire, incorporating five Knowledge, seven Attitudes, and twelve Practice questions, was developed in Urdu and later translated into English for analysis. The validity of the questionnaire was assessed to ensure it accurately measured the intended construct through appropriate methods and expert review. Consent was signed, and parents were informed about the importance of the study. The questionnaire was created in Kobo and administered in digital format through a tablet. For those who could not use a tablet, printouts of the questionnaire were provided. Demographic data included age, gender, occupation, education, and marital status. Types of intestinal parasites, transmission modes, infestation symptoms, prevention and control methods, and infestation complications were covered under the KAP section. Scoring for Knowledge, Attitudes, and Practices was performed according to the Guttmann scale, Likert scale, and Ordinal scale respectively. Responses of KAP were dichotomous as good (coded 1) or poor (coded 0) by taking the cut-off score from the computed values of each: a cut-off value of 5 for knowledge, 28 for attitudes, and 9 for practices. Scores greater than the cutoff values were regarded as good and less as poor. The data were analysed using IBM SPSS version 27. Descriptive statistics were calculated in the first step. For inferential statistics, the chi-squared test was used to estimate the association between sociodemographic characteristics and KAP levels. Binary logistic regression with odds ratio (OR) of 95%, was applied. This study was approved by the Institutional Review Board of Green International University (Ref No. IRB-GIU-FMAHS/0052/24).

RESULTS

Among the 348 respondents, an equal proportion were in the 26 to 35 (33.9%) and 36 to 45 (33.9%) age groups. Female respondents outnumbered male respondents (77.4%). Occupation had the highest prevalence among housewives (50.9%). There was a preponderance of intermediate education (26.1%) (Table 1).

Table 1: Socio-Demographic Factors of Respondents

Factors	Frequency (%)
Age (Years)	
15-25	27 (7.8)
26-35	118 (33.9)
36-45	118 (33.9)
46-55	68 (19.5)
56-65	17 (4.9)
Mean ± SD	38.49 ± 9.648
Gender	
Male	79 (22.7)
Female	269 (77.3)
Occupation	
Business	50 (14.4)
Government Employee	35 (10.1)

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Private Employee	73 (21)
Retired	2 (0.6)
Unemployed	11 (3.2)
Housewife	177 (50.9)
Marital Status	
Married	342 (98.30)
Widowed	4 (1.1)
Divorced	2 (0.6)
Education	
No Formal Education	13 (3.7)
Primary	26 (7.5)
Mid School	35 (10.1)
Secondary School	63 (18.1)
Intermediate	91 (26.1)
Graduates	109 (31.3)
MS	10 (2.9)
PhD	1 (0.3)

Analysis revealed that the majority of respondents were unaware of E. histolytica/dispar (99.4%). Of these, 83.9% knew hand washing as a preventive mechanism. Moreover, 85.1% of respondents did not know that contaminated water could transmit IPs. Analysis regarding attitude showed that 28.4% of participants believed that intestinal parasites could be treated and prevented, but 1.1% disagreed that they could be avoided by using soap. A proportion of 21.6% believed that food prepared outdoors was an IPI risk factor. Practices were driven by IPI knowledge and attitudes. Among common practices, 98.9% washed their utensils before cooking. Among the respondents, 56% had poor knowledge, 60.9% had poor attitudes, and 51.7% had poor practices (Table 2).

Table 2: Frequency Distribution of Knowledge, Attitude and Practices of IPI Patients

Variables		NO Frequency (%)	Yes Frequency (%)
Knowledge			
Intestinal Parasite?	A. Lumbricoids	343 (98.6)	5 (1.4)
	E. Histolytica /Dispar	346 (99.4)	2 (0.6)
	G. Lamblia	341 (98)	7 (2)
	Hookworm	328 (94.30)	20 (5.7)
	E. Histolytica / Dispar +G. Lamblia	346 (99.4)	2 (0.6)
	Hookworm + E. Histolytica /Dispar	348 (100)	0 (0)
	A. Lumbricoids + G. Lamblia	347 (99.7)	1 (0.3)
	Others	19 (5.5)	329 (94.5)
Preventive Mechanism?	Handwashing	292 (83.9)	56 (16.1)
	Latrine Usage	286 (82.2)	62 (17.8)
	Washing Vegetables	276 (79.3)	72 (20.7)
	Avoid Food and Water Contamination	234 (67.2)	114 (32.8)
	Handwashing + Latrine Usage	246 (70.7)	102 (29.3)
	Washing Vegetables + Latrine Usage	227 (65.2)	121 (34.8)
	Other	234 (67.2)	114 (32.8)
Transmission modes?	Soil Contact	253 (72.7)	95 (27.3)
	Contaminated Water	296 (85.1)	52 (14.9)
	Contaminated Food	289 (83)	59 (17)
	Uncooked Vegetables + Unclean Fruits	268 (77)	80(23)
	Contaminated Food + Water	257 (73.9)	91 (26.1)
	Contaminated Food + Soil Contact	242 (69.5)	106 (30.5)
	Uncooked/ Unclean Vegetables/ Fruits + Soil Contact	246 (70.7)	102 (29.3)
	Other	256 (73.6)	92 (26.4)
Signs and Symptoms?	Diarrhea	264 (75.9)	92 (26.4)
	Abdominal Cramps	284 (81.6)	64 (18.4)
	Vomiting	286 (82.2)	62 (17.8)
	Anorexia	293 (84.2)	55 (15.8)
	Diarrhea + Vomiting	257 (73.9)	91 (26.1)
	Diarrhea + Abdominal Cramps	220 (63.2)	128 (36.8)
	Other	254 (73)	94 (27)
Signs and Symptoms?	Malnutrition	276 (79.3)	72 (20.7)
	Anemia	290 (83.3)	58 (16.7)
	Growth Retardation	271 (77.9)	77 (22.1)
	Malnutrition + Growth Retardation	230(66.1)	118 (33.9)
	Anemia + Growth Retardation	240 (69)	108 (31)
	Other	248 (71.3)	100 (28.7)
Practices			
Stool Examination History		311 (89.4)	37 (10.6)
Wash the Child's Hands Before A Meal		8 (2.3)	340 (97.7)
Washing Child's Hands After Meal		9 (2.6)	339 (97.4)
Cutting A Child's Nails?		11 (3.2)	337 (96.8)
Medicating Children for Prevention		105 (30.2)	243 (69.8)
Using Tap Water for Prevention		217 (62.4)	131 (37.6)
Using Chemically Treated Water (Boiled, Filtered, Etc.) for Prevention.		154 (44.3)	194 (55.7)

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Wash The Child's Hands After Defecation.	9 (2.6)	339 (97.4)
Pre-Diagnosis Of Intestinal Parasitic Infection.	96 (27.6)	252 (72.4)
Using Soap To Clean Utensils.	5 (1.4)	343 (98.6)
Washing Utensils Before Cooking Meals.	4 (1.1)	344 (98.9)
Wash Fruits And Raw Vegetables Before Eating.	6 (1.7)	342 (98.3)

Attitudes					
Variables	**Extremely Disagree**	**Disagree**	**Neutral**	**Agree**	**Extremely Agree**
	F (%)	**F (%)**	**F (%)**	**F (%)**	**F (%)**
Lack of hygiene is one of the IPI causes.	0 (0)	1 (0.3)	18 (5.2)	290 (83.3)	39 (11.2)
IPI is preventable and treatable.	2 (0.6)	5 (1.4)	31 (8.9)	211 (60.6)	99 (28.4)
IPI can be reduced by health education.	1 (0.3)	7 (2)	50 (14.4)	223 (64.1)	67 (19.3)
One IPI complication is growth retardation.	2 (0.6)	3 (0.9)	52 (14.9)	232 (66.7)	59 (17)
Washing the face and hands with soap can prevent IPI.	4 (1.1)	10 (2.9)	51 (14.7)	237 (68.1)	46 (13.2)
Raw food consumption is one of the IPI causes.	0 (0)	13 (3.7)	49 (14.1)	250 (71.8)	36 (10.3)
Outdoor food is a risk factor for IPI.	2 (0.6)	15 (4.3)	42 (12.1)	214 (61.5)	75 (21.6)

Level of Knowledge, Attitude and Practices was shown (Table 3).

Table 3: Level of Knowledge, Attitude and Practices

Level of Knowledge	
Poor	195 (56)
Good	153 (44)
Mean ± SD	27.96 ± 3.96
Level of Attitude	
Poor	212(60.9)
Good	136(39.1)
Mean ± SD	8.04 ± 4.59
Level of Practices	
Poor	180(51.7)
Good	168(48.3)
Mean ± SD	9.31 ± 1.32

Pearson chi-square associated p-values (X2) showed that knowledge was associated only with attitudes (p<0.001). Attitude was significantly correlated with age (p=0.011), gender (p<0.001), occupation (p=0.005), educational status (p<0.001), and attitudes (p=0.013). Lastly, good practices were significantly correlated with marital status (p=0.038) (Table 4).

Table 4: Factors Associated with Parents' Knowledge, Attitudes, and Practices Regarding IPI

	Knowledge					**Attitude**					**Practices**				
Factors	**Poor %**	**Good %**	**Total**	**X^2 p-value**	**df**	**Poor %**	**Good %**	**Total**	**X^2 p-value**	**df**	**Poor %**	**Good %**	**Total**	**X^2 p-value**	**df**
Age															
15–25	14 (51.9)	13 (48.1)	27	0.648	4	15 (55.6)	12 (44.4)	27	0.011*	4	14 (51.9)	13 (48.2)	27	0.285	4
26–35	65 (55.08)	53 (45)	118			65 (55.1)	53 (44.9)	118			66 (56)	52 (44.1)	118		
36–45	72 (61.02)	46 (39)	118			68 (57.6)	50 (42.4)	118			54 (45.8)	64 (54.2)	118		
46–55	34 (50)	34 (50)	68			48 (70.6)	20 (29.4)	68			34 (50)	34 (50)	68		
56–65	10 (58.8)	7 (41.2)	17			16 (94.1)	1 (5.9)	17			12 (70.6)	5 (29.4)	17		
Gender															
Male	48 (60.8)	31 (39.2)	79	0.336	1	64 (81.01)	15 (19)	79	<0.001**	1	40 (50.6)	39 (49.4)	79	0.825	1
Female	147 (54.6)	122 (45.4)	269			148 (55)	121 (45)	269			140 (52)	129 (48)	269		
Occupation															
Unemployed	7 (63.6)	4 (36.4)	11	0.972	5	10 (20)	1 (9.1)	11	0.005**	5	7 (63.6)	4 (36.4)	11	0.740	5
Business	29 (58)	21 (42)	50			39 (78)	11 (22)	50			25 (50)	25 (50)	50		
Govt. Employee	20 (57.1)	15 (42.9)	35			20 (57.1)	15 (42.9)	35			17 (48.6)	18 (51.4)	35		
Private Employee	38 (52.1)	35 (47.9)	73			34 (46.6)	39 (53.4)	73			33 (45.2)	40 (54.8)	73		
Retired	1 (50)	1 (50)	2			1 (50)	1 (50)	2			1 (50)	1 (50)	2		
House Wife	100 (56.5)	77 (43.5)	177			108 (61)	69 (39)	177			97 (54.8)	80 (45.2)	177		
Marital Status															
Married	192 (56.2)	4 (36.4)	342	0.956	2	208 (60.8)	134 (39.2)	342	0.476	2	180 (52.6)	162 (47.4)	342	0.038*	2
Divorced	1 (50)	1 (50)	2			2 (100)	0 (0)	2			0 (0)	2 (100)	2		
Widowed	2 (50)	2 (50)	4			2 (50)	2 (50)	4			0 (0)	4 (100)	4		
Education															
No formal education	8 (61.5)	5 (38.5)	13	0.223	8	11 (84.6)	2 (15.4)	13	<0.001**	8	6 (46.2)	7 (53.8)	13	0.714	8
Primary	20 (76.9)	6 (23)	26			23 (88.5)	3 (11.5)	26			18 (69.2)	8 (30.8)	26		
Mid school	21 (60)	14 (40)	35			27 (77.1)	8 (22.9)	35			17 (48.6)	18 (51.4)	35		
Secondary school	36 (56.3)	28 (43.8)	64			47 (73.4)	17 (26.6)	64			32 (50)	32 (50)	64		

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Intermediate	48 (52.8)	43 (47.3)	91			49 (53.8)	42 (46.15)	91			45 (49.5)	46 (50.5)	91		
Graduates	55 (50.5)	54 (49.5)	109			53 (48.6)	56 (51.4)	109			57 (52.3)	55 (50.5)	109		
MS	6 (66.7)	3 (33.4)	9			1 (11.1)	8 (88.9)	9			4 (44.4)	5 (55.6)	9		
PhD	1 (100)	0	1			1 (100)	0 (0)	1			1 (100)	0 (0)	1		
Attitudes						**Practices**									
Poor	96 (45.2)	116 (54.7)	212	25.5 <0. 001**	1	121 (67.2)	59 (32.8)	180	6.2 0.013*	1	- -				
Good	99 (72.8)	37 (27.2)	136			91 (54.2)	77 (45.8)	168							
Practices															
Poor	100 (55.6)	80 (44.4)	180	0.04 0.852	1	- -									
Good	95 (56.5)	73 (43.5)	168												

*Significant at 95% Confidence Interval, ** Significant at 99% Confidence Interval

Binary logistic regression demonstrates that knowledge can only be predicted by attitude. Parents with good knowledge were 3.2 times more likely to have good attitudes than poor attitudes. All factors except marital status predicted attitudes (Hosmer-Lemeshow chi-square=8.4; p=0.4). Female parents between ages 26-35 years were more likely to develop good attitudes (Unadjusted OR 13.05; 95% CI=1.7–101.6) than those aged 56-65 years. Intermediate-, graduate-, and master-level parents were more likely to have better attitudes than those with secondary education. Good practices were significantly predicted by good attitudes (Adjusted ORs=0.6; 95% CI=0.4–0.9)(Table 5).

Table 5: Binary Logistic Regression for Factors Associated with Good Levels of Knowledge, Attitudes and Practices Towards IPI

Factors		Categories	Un-adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Knowledge	Attitude	Good	3.2 (2.0–5.1)	<0.001	3.2 (2.0–5.1)	<0.001
		Poor (1)				
Attitude	Knowledge	Good	3.2 (2.0–5.1)	<0.001	5.3 (3.0–9.2)	<0.001
		Poor (1)				
	Age	15–25	12.8 (1.5–11 0.8)	0.02	5.02 (0.3–96.4)	0.3
		26–35	13.05 (1.7–1 01.6)	0.01	4.8 (0.3–84.6)	0.3
		36–45	11.8 (1.5–91.7)	0.01	6.08 (0.3–108)	0.2
		46–55	6.7 (0.8–5 3.7)	0.07	5.04 (0.3–9 1.2)	0.3
		56 – 65 (1)				
	Gender	Male	3.5 (1.9–6.4)	<0.001	0.3 (0.1–0.7)	0.005
		Female (1)				
	Education	No Formal Education	0.5 (0.1–2.5)	0.4	0.6 (0.1–3.5)	0.5
		Primary	0.3 (0.1–1.3)	0.1	0.3 (0.1–1.4)	0.1
		Mid School	0.8 (0.3–2.1)	0.6	0.8 (0.3–2.2)	0.6
		Secondary (1)				
		Inter mediate	2.3 (1.2–4.6)	0.017	2.6 (1.2–5.7)	0.01
		Graduates	2.9 (1.5–5.6)	0.002	3.5 (1.6–7.6)	0.002
		Masters	10.8 (2.1 –56.2)	0.005	60.8 (3.8 –974.3)	0.004
		PhD	0	1	0	1
	Occupation	**Unemployed (1)**				
		Business	0.2 (0.0 2–1.3)	0.08	0.3 (0.03 –3.2)	0.31
		Govt. employee	0.4 (0.2 –0.9)	0.03	1.1 (0.4 –3.4)	0.8
		Private employee	1.2 (0.6 –2.4)	0.7	1.0 (0.4 –2.6)	1
		Retired	1.8 (1.04 –3.1)	0.04	1.5 (0.7 –2.9)	0.3
		Housewife	1.6 (0.1 –25.4)	0.8	9.3 (0.1 –736.2)	0.3
	Practices	**Poor (1)**				
		Good	0.6 (0.4 –0.9)	0.01	0.6 (0.3 –0.9)	0.03
Practices	Attitudes	**Poor (1)**				
		Good	0.6 (0.4 –0.9)	0.01	0.6 (0.4 –0.9)	0.01

DISCUSSION

This study is among the few studies conducted in the past 5 years that checked the KAP level of IPI among parents of infected children. Overall, a poor level of KAP prevailed, concurrent with other studies in which half and less than two-thirds were low in KAP state [11, 12]. In this study, females outnumbered males. In another predictive study on knowledge and practice in helminthic infection prevention, females (55.7%) were more prevalent than males. The prevalent age range in both studies was 26–35 years [13]. In this study, the majority of parents were of intermediate educational status (26.1%), while in other studies, the highest proportion was illiterate (70.2%) and of secondary education (62.3%). This difference may be due to the rise in awareness of IPI as a result of education campaigns. A higher proportion of parents were housewives (50.9%), which complies with another study's statistics of 51.4% of housekeeping mothers of IPI-infected children [13, 14]. In this study, soil contact with contaminated food was regarded as a mode of parasite transmission. This is supported by another similar study, in

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which 47.8% of the respondents knew that feces were a source of infection [14]. In the same study, 62.5% of the respondents knew of helminthic parasites, which was further supported in this study by the statistics of 5.7%. Previously conducted research outlined that 93.4% of respondents always wash their hands before eating, 94.9% wash their hands after defecation, and 94.9% always wash fruits and vegetables before eating, as a general practice. These proportions are close to the values reported in this study. In practice, 55.7% of the parents in this study used chemically treated water to prevent the disease, whereas a comparative study reported a prevalence of 93.4% in the use of boiled water for drinking. The KAP survey showed that 60.6% of the parents agreed and 28.4% disagreed with the statement that intestinal parasites can be prevented and treated, while two studies declared parents' attitudes towards worms and protozoans to be harmful [15, 16]. The study found no significant association between knowledge and sociodemographic variables. This may be due to unawareness of the scientific names of parasites or proper IPI medical knowledge. However, other studies have reported associations of knowledge with education and age (0.042) [17-19]. Our study showed associations of attitudes with age, education, gender, practices, knowledge, and occupation. Another study showed significant associations of attitudes with age, ranging from 21 to 100 years, and education [20]. It also demonstrated that university-going individuals were 1.30 times more likely to possess better attitudes towards parasite prevention. This aligns with our findings that MS-level parents were 60.8 times more likely to possess good attitudes than secondary school parents. This KAP survey was conducted on parents of both sexes and assessed the predictors using a regression model, unlike other studies that only surveyed mothers or infected children and used simple association or prevalence statistics [15]. The high chi-square value and low p-value of the Hosmer and Lemeshow test for model fit indicated that the model was an average fit for predicting KAP.

CONCLUSIONS

It was concluded that there is a low prevalence of KAP in Lahore and Punjab. Parents with intermediate-, graduate-, and master-level education possessed good attitudes. However, good practices were not directly associated with these factors, suggesting a gap in the execution of IPI-related practices. Overall, good knowledge determines a good attitude that controls good practices; hence, a focus on augmenting IPI knowledge among parents should be the top priority of healthcare, especially for mothers.

Authors Contribution

Conceptualization: KZ
Methodology: SH, KP, ZA, MHHK
Formal analysis: MHHK
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All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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