Original Research Article

Assessment of nutritional status of children of age 5-14 years in covered rural area of Private Medical College, Kanpur

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Abstract

Introduction: Globally, there were 821 million undernourished people in 2017 (11% of the total population). Under nutrition is more common in developing countries. In India, even today, after six decades of independence and despite various initiatives, the condition of undernourished children remains a cause of concern in the country. Magnitude of the problem become clearer by our research on assessment of nutritional status of children aged 5-14 years in rural areas of Kanpur.

Materials and Methods: This is a cross sectional study conducted among 410 randomly selected children of age 5 to 14 years in the rural field areas of Rama medical College & Research Centre. Sample size 410 was calculated by using statistical formula $n \geq 4p\ q^2/L$. Data was collected and analyzed by using appropriate statistical software and tools.

Results: The education of the parents of study subjects and their nutritional status was found to be statistically significant (X2=15.66 P=0.001).The association between socioeconomic class of children and their nutritional status was found to be statistically significant (X2=10.284 p=0.016). Under weight children were found more in Joint Family 35%. Overall prevalence of underweight, stunting and thinness (BMI<-2SD) for age/sex among children were 27.8%, 22.9% and 22% respectively. Study also concluded that prevalence of under nutrition was found to be higher among females as compared to males.

Conclusion: The study shows undernourished children were found to be significantly associated with age, sex and education of the parents, socioeconomic class of the family and type of the family. It was significantly higher in females, age of puberty, children of uneducated mothers or of lower class family or belonging to joint family. Health education should be added in the school curriculum and it is needed to raise the maternal literacy particularly related to health care seeking behavior.

Keywords: Undernourished, Children of age 5-14 years, Underweight, Stunting, Thinness.

Introduction

Malnutrition in children is a common global problem; contribute in irreversible negative impact on health viz. child morbidity and mortality, ultimately affecting productivity which reduces economic growth. The World Health Organization (WHO) estimates hat malnutrition accounts for 54 percent of child mortality worldwide,[1] about 1 million children.[2] WHO also estimates that childhood underweight is the cause for about 35% of all deaths of children under the age of five years worldwide.[3] There were 821 million undernourished people in the world in 2017 (11% of the total population).[4] This is a reduction of about 176 million people since 1990 when 23% were undernourished.[4,5]

Undernutrition is more common in developing countries.[6] In India, even today, after six decades of independence and despite various initiatives both on the legal as well as policy and programme levels, the condition of children remains a cause of concern in the country. There are some commonly used measures for detecting malnutrition in children:[7-9]

Stunting

Height for age is below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age (stunted) and are chronically malnourished.

Underweight

Weight for age is below minus 2 SD from the median of the reference population), It takes into account both acute and chronic malnutrition. And

Wasting-extremely low weight for height below -2SD from the median of the reference population are considered thin (wasted) for their height and are acutely malnourished.).[10]

Thinness

(Measure of body fat) is defined as a low body mass index. Children with z scores (BMIZ)< −2 are considered as thin.

In India, NFHS-4 (2015-16) estimates 38% of children under age five years as stunted (too short for their age) which signify chronic under-nutrition. The prevalence of stunting in India has decreased from 48% in 2005-06 to 38.4% in 2015-16. Stunting is observed to be higher among children in rural areas (41%) than urban areas (31%). NFHS-4 results reveal that, 21% wasted and 36% of children under age five years are underweight.[11]

In 2010 protein-energy malnutrition resulted in 600,000 deaths down from 883,000 deaths in 1990.[12] It is obvious that there is urgent need to focus on the nutritional and overall developmental needs of children. In India, there are number of studies among under 5 years malnourished children and a number of nutritional programme running for pre-school and school going children but still nutritional status of children of age between 5-14 years is not so improved as expected. Magnitude of the problem become clearer by our research on assessment of nutritional status of children aged 5-14 years in rural areas of Kanpur.

Materials and Methods

This is a cross sectional study conducted among children of age group 5 to 14 years in the rural field areas of Rama medical College & Research Centre in a duration of one year (Jan. to Dec.2018).Sample size is calculated by using prevalence of stunting (chronic malnutrition) among children in rural areas of Uttar Pradesh as per NFHS-4 data[11] was 48.5% and by applying the statistical formula to calculate sample size. Sample size (n)

$$n^3 \geq \frac{Z^2_{1+\alpha/2} \times p \times (1\text{-}p)}{L^2}$$

$$n^3 \geq \frac{(1.96)^2 \times 0.485 \times 0.515}{(0.0485)^2} = 408$$

Where p is the prevalence considered as 48.5, L is the allowable error taken as 10% of p (prevalence)... Z=Standard normal variable. Adjusting for the non response, the sample size was taken 410 in this study.

There are total twenty four villages in covered field area of RHTC, Rama Medical College and Research Centre, Kanpur; out of this six villages(viz. Dubiana, Bhalpura,

Mahipalpur, Kakupur, Thaliniwala, Chakabaka) were randomly selected by using computer generated random number by opting simple randomization method. 1st house was selected purposively then every 5th house in serial order, were visited and interviewed till our sample size of 410 children were achieved. All eligible children residing in the house were included in the study. Children or parents, who were not willing to give the consent or were seriously ill or hospitalized or were shifted / not found at the time of visits, were excluded from our present study.

Ethical clearance was taken for the study from Institutional ethical committee. A set proforma of predesigned, pre-tested semi-structured questionnaire were used for taking the interview. After taking the consent from parents, eligible children were examined physically and clinically. Anthropometric measurements viz. height, weight was taken by applying standardized techniques recommended by WHO.[13] Assessment of nutritional status of children was done by calculating Weight for age, Height for Age and Body Mass Index for age and sex and using WHO growth reference standards. Data was collected and analyzed by using appropriate statistical software and tools.

Results

Table 1: Gender-wise Distribution of study children of age 5-14 years

Gender	Mean Age (in years)	N (%)	Std. Deviation
Male	10.54	226(55.12)	2.66
Female	9.94	184(44.88)	2.68
Total	10.27	410(100)	2.68

Table 1 depicts mean age with standard deviation of boys was 10.546±2.66 years and mean age of girls were 9.94±2.68 years

Table 2a: Weight for Age with Socio-demographic profile of study subjects

Distribution of study children according to weight for age				
	Weight for age			
Gender	Normal	Underweight	Total	Chi-square Test
	N (%)	N (%)	N (%)	
Male	163(74.8)	55(25.2)	218(53.2)	X^2=1.538
Female	133(69.3)	59(30.7)	192(46.8)	P=0.226
Total	296(72.2)	114(27.8)	410(100)	
Weight in Kg Mean ± SD	30.95±8.37	19.61±3.613		
Distribution of children according to 'Education of Father'				
Educated	247(74.4)	85(25.6))	332(81.0)	X2=4.217
Uneducated	49(62.8)	29(37.2)	78(19.0)	df =1 P=0.049
Total	296(72.2)	114(27.8)	410(100.0)	
Distribution of children according to' Education of Mother'				
Educated	205(78.8)	55(21.2)	260(63.4)	X2=15.66
Uneducated	91(60.7)	59(39.3)	150(36.6)	df =1 P=0.001
Total	296(72.2)	114(27.8)	410(100.0)	
Distribution of children according to 'Socioeconomic Class'				
Upper/Upper Middle	12(92.3)	1(7.7)	13(3.2)	X2=10.284 df=3

Middle	61(81.3)	14(18.7)	75(18.3)	p=0.016
Lower Middle	129(73.3)	47(26.7)	176(42.9)	
Lower	94(4.4)	52(35.6)	146(35.6)	
Total	296(72.2)	114(27.8)	410(100.0)	
Distribution of children according to 'Family Type'				
Nuclear	155(80.3)	38(19.7)	193(47.1)	Chi Square = 11.965, df=1, p=0.001
Joint	141(65.0)	76(35.0)	217(52.9)	
Total	296(72.2)	114(27.8)	410(100)	

*Weight for age Boys / Girls (WHO 2007 reference[14,15]

Table 2a depicts out of total 410 study children, male and female were 53.2%(218), 46.8%(192) respectively. In this Normal Weight for Age children were 72.2%(296); Male 74.8%(163), Female 69.3%(133) and Underweight children were 27.8%(114); Male 25.2%, Female 30.7%. Mean weight for age of normal Weight children was 30.95±8.37 Kg while mean weight for age of underweight children was 19.61±3.613 Kg.

Uneducated parents have more percentage of underweight children viz. Father 37.2%; Mother 39.9%. Percentage of underweight children were gradually increasing from upper to lower class viz. Upper/Upper Middle 7.7%; Middle18.7%, Lower Middle 26.7%; Lower 35.6%. Underweight children were found more in Joint Family 35% than Nuclear Family 19.7%.

Table 2b: Age-wise distribution of study children according to Weight for Age

Age (in completed yrs.)	Weight for age Boys / Girls					
	Male(n=218)		Female(n=192)		Total(n=410)	
	Normal N (%)	Underweight N (%)	Normal N (%)	Underweight N (%)	Normal N (%)	Underweight N (%)
5	3(75.0)	1(25.0)	2(66.7)	1(33.3)	5(71.4)	2(28.6)
6	11(84.6)	2(15.4)	13(76.5)	4(23.5)	24(80.0)	6(20.0)
7	27(90.0)	3(10.0)	26(86.7)	4(13.3)	53(88.3)	7(11.7)
8	21(52.5)	19(47.5)	11(44.0)	14(56.0)	32(49.2)	33(50.8)
9	24(82.8)	5(17.2)	25(78.1)	7(21.9)	49(80.3)	12(19.7)
10	3(60.0)	2(40.0)	2(50.0)	2(50.0)	5(55.6)	4(44.4)
11	4(66.7)	2(33.3)	7(70.0)	3(30.0)	11(68.8)	5(31.3)
12	24(85.7)	4(14.3)	12(66.7)	6(33.3)	36(78.3)	10(21.7)
13	14(70.0)	6(30.0)	17(56.7)	13(43.3)	31(62.0)	19(38.0)
14	32(74.4)	11(25.6)	18(78.3)	5(21.7)	50(75.8)	16(24.2)
Total	163(74.8)	55(25.2)	133(69.3)	59(30.7)	296(72.2)	114(27.8)
	X2=18.663,df=9, p=.028		X2=17.042 df=9 p=.045		X2=28.583 df=9, P=.001	

*Weight for age Boys / Girls (WHO 2007 reference)[14,15]

Table2b shows among study boys, 74.8% were of normal weight for age and 25.2% were underweight for age. Maximum underweight boys were of age 8 yrs, 19(47.5%). Underweight girls were mostly of age 8 years 56.0%; 13 years, 43.3%. Overall children of different age group having normal weight were 72.2% while underweight children were 27.8%.
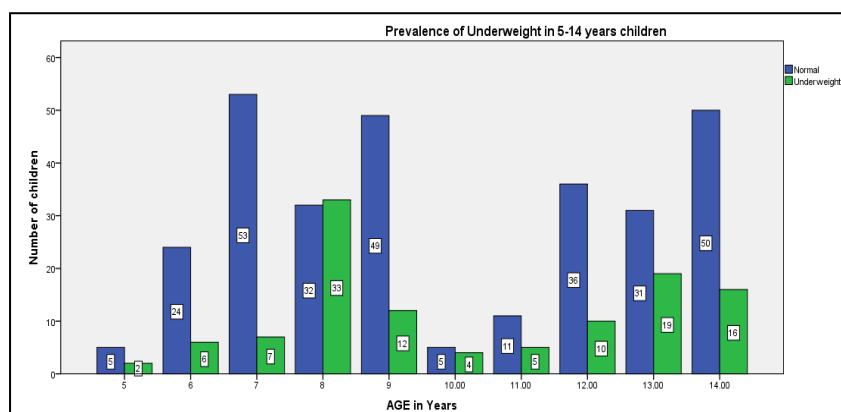

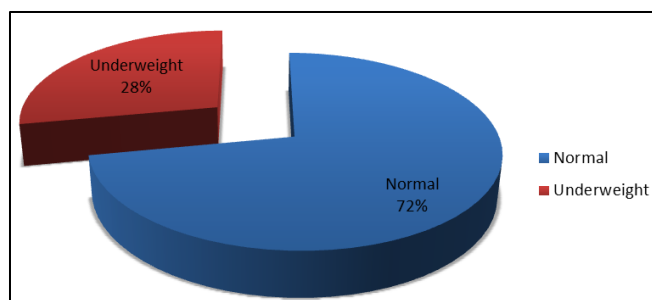**Fig. 1a**: Distribution of Total study children according to Weight for Age (n=410)

Fig. 1b: Prevalence of Underweight in 5-14 years children in rural Kanpur

Table 3a: Age-wise distribution of study children according to Height for Age

Age (in completed yrs.)	Gender					
	Male(n=218)		Female(n=192)		Total (9n=410)	
	Normal Ht. (± 2SD) N (%)	Stunting (-2SD) N (%)	Normal Ht. (± 2SD) N (%)	Stunting (-2SD) N (%)	Normal Ht. (± 2SD) N (%)	Stunting (-2SD) N (%)
5	2(50.0)	2(50.0)	1(33.3)	2(66.7)	3(42.9)	4(57.1)
6	10(76.9)	3(23.1)	13(76.5)	4(23.5)	23(76.7)	7(23.3)
7	28(93.3)	2(6.7)	25(83.3)	5(16.7)	53(88.3)	7(11.7)
8	23(57.5)	17(42.5)	13(52.0)	12(48.0)	36(55.4)	29(44.6)
9	21(72.4)	8(27.6)	25(78.1)	7(21.9)	46(75.4)	15(24.6)
10	4(80.0)	1(20.0)	2(50.0)	2(50.0)	6(66.7)	3(33.3)
11	5(83.3)	1(16.7)	9(90.0)	1(10.0)	14(87.5)	2(12.5)
12	23(82.1)	5(17.9)	15(33.3)	3(16.7)	38(82.6)	8(17.4)
13	15(75.0)	5(25.0)	28(93.3)	2(6.7)	43(86.0)	7(14.0)
14	38(88.4)	5(11.6)	16(69.9)	7(30.4)	54(81.8)	12(18.2)
Total	169(77.5)	49(22.5)	147(76.6)	45(23.4)	316(77.1)	94(22.9)
	$X2=19.14$ df=9, p=.024		$X2=20.78$ df=9 p=.014		$X2=31.77$ df=9, P=.001	

Table 3a shows majority study boys of normal height were of 14 yrs age group while stunted boys(-2SD) were mostly of 8 and 9 years age group. Overall 22.5% boys were stunted. Majority of girls of age group 8 yrs and 9 yrs were found to be stunted. Overall 77.1% of study children were of normal height while stunted children were 22.9%.

Table 3b: Distribution of study children according to Height for Age

Height for Age(cm)	N (%)	Mean Height ±2SD in cm.	Chi-square Test
Normal HT (±2SD)	316(77.1%)	134.99±16.98	P=0.001
Stunting (< - 2SD)	94(22.9%)	116.79±16.40	

*Height for age Boys/Girls (WHO 2007 reference)[14,15]

Table 3b depicts height for age of normal Ht. children were of mean height 134.99±16.98 cm. while mean height of stunted children was 116.79±16.40 cm.
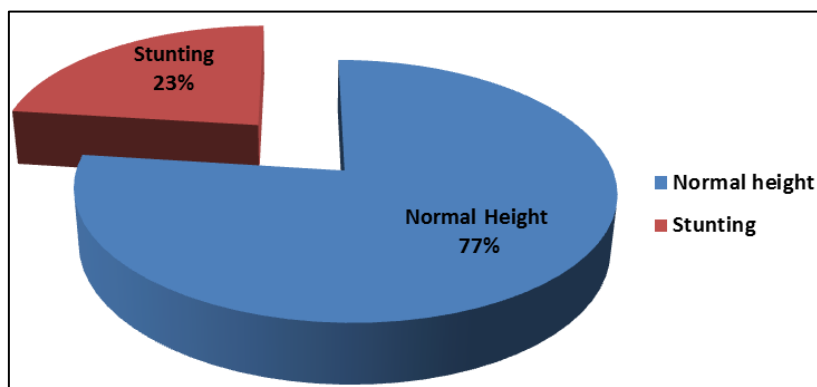

Fig. 2: Showing prevalence of stunting in 5-14 years children in rural areas

Table 4a: Age-wise distribution of study children according to Body Mass Index for Age/Sex

Age (in yrs.)	Gender					
	Male(n=218)		Female(n=192)		Total(n=410)	
	Normal BMI N (%)	BMI (< - 2 SD) Thinness N (%)	Normal BMI N (%)	BMI (< -2SD) Thinness N (%)	Normal BMI N (%)	BMI (< -2SD) Thinness N (%)
5	1(25.0)	3(75.0)	1(33.3)	2(66.7)	2(28.6)	5(71.4)
6	8(61.5)	5(38.5)	14(82.4)	3(17.6)	22(73.3)	7(26.7)
7	28(93.3)	2(6.7)	25(83.3)	5(16.7)	53(88.3)	7(11.7)
8	28(70.0)	12(30.0)	11(44.0)	14(56.0)	39(60.0)	26(40.0)
9	23(79.3)	6(20.7)	28(87.5)	4(12.5)	51(83.6)	10(16.4)
10	3(60.0)	2(40.0)	3(75.0)	1(25.0)	6(66.7)	3(33.3)
11	5(83.3)	1(16.7)	8(80.0)	2(20.0)	13(81.2)	3(18.8)
12	25(89.3)	3(10.7)	14(77.8)	4(22.2)	39(84.8)	7(15.2)
13	18(90.0)	2(10.0)	21(70.0)	9(30.0)	39(78.0)	11(22.0)
14	37(86.0)	6(14.0)	19(82.6)	4(17.4)	56(64.8)	10(15.2)
Total	169(77.5)	49(22.5)	147(76.6)	54(23.4)	320(78.0)	90(22.0)
	$X2=21.74$ df=9, p=.010		$X2=21.18$ df=9 p=.012		$X2=31.33$ df=9, P=.001	

Table 4a shows BMI<-2SD (Thinness) were found mostly among 8yrs (12/49) and 9 yrs (6/49) boys. BMI <-2SD (Thinness) in girls,were found mostly in 8year (14/54) and 13 year (9/54). Overall children with BMI<-2SD (Thinness) were 22%.

Table 4b: Distribution of study children according to Body Mass Index for Age/Sex

BMI for Age/Sex	N (%)	Mean BMI±2SD	Chi-square Test
Normal (±2SD)	320(78.0%)	16.28±2.26	P=0.001
BMI (< - 2 SD) (Thinness)	90(22.0%)	13.03±0.92	

Table 4b depicts Mean of normal BMI±2SD of children for age/sex were 16.28±2.26 while children of BMI (< - 2 SD)(Thinness) were 13.03±0.92.
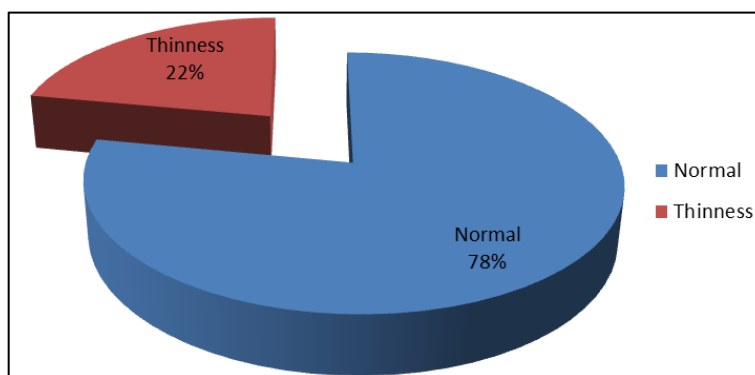
Fig. 3: Prevalence of Thinness (BMI <-2SD) in Rural areas of Kanpur

Discussion

Present study was undertaken amongst children of age 5 to 14 years residing in rural areas of Kanpur. This Age period is a changing phase of life, from growing childhood period to adolescent. Mean age of boys and girls were 10.546±2.66 years and 9.94±2.68 years respectively (Table 1). Mean weight for age of normal Weight children Vs underweight children were 30.95±8.37 Kg and19.61±3.613 Kg respectively.(Table 2a) Amruth M et al (2015) study found similar prevalence of underweight children but malnutrition among boys were more than girls. Result is different from the present study.[16] Education of parents has positive effect on Weight for Age of children. Majority of children of

illiterate parents were underweight for age viz. Father 37.2%Mother 39.9%. This difference is found to be statistically significant (p < 0.05). Similar effect was observed by Ghosh J. et al study.[17] Percentage of underweight children were found gradually increasing from upper to lower class viz. Upper/Upper Middle7.7%;Middle 18.7%,Lower Middle 26.7%;Lower 35.6%. This difference is found to be statistically significant (X2=10.284 p=0.016). Under weight children were found more in Joint Family 35% than Nuclear Family 19.7%. This difference is found to be statistically significant (p < 0.05. (Table 2a). Ajit Kumar Dey et al study (2015)[18] observed similar finding viz. undernourished children were more in Joint and Illiterate

family. Education status of Parents particularly had a positive impact on nutritional status of children.

In present study, prevalence of underweight for age girls (30.7%) was more than boys (25.2%) and no child was belonging to overweight or obese category. Overall prevalence of underweight children was 27.8%.This difference is found to be statistically significant. (X2=28.583 df=9, P=.001) (Table 2b, Fig. 1). Findings are different from Shivaprakash N et al (2014)[19] and Dey AK et al study(2015)[18] except age 14 and 15yrs where mean height and weight of boys were exceeded than girls.Findings are different from present study. Ghosh J. et al study[17] also reported that prevalence of underweight as 38.65%.

Overall stunted children were 22.9%. This difference is found to be statistically significant(X2=31.77 df=9, P=.001)[Table 3a, Fig. 2]. Mean height for age of children were normal and stunted children were 134.99±16.98 cm and 16.79±16.40 cm respectively [Table 2b]. The study conducted by Amruth M et al,[16] Ghosh J et al[17] found almost similar prevalence of stunting children but prevalence of malnutrition was more in boys than girls. Mandal S et al(2014)[20] study found prevalence of stunting 40%, this is different from our study.

Children with BMI<-2SD (Thinness) was found in 22%. This difference is found to be statistically significant (X2=31.33 df=9, P=.001). [Table 4a, Fig. 3]. Mean BMI±2SD of children having normal BMI for age/sex were 16.28±2.26 while children of BMI (< - 2 SD)(Thinness) were having mean BMI 13.03±0.92. [Table 4b]

Similar study conducted by Gupta M et al (2015)[21] found 51.1% were undernourished and 48.9% were having normal nutritional status according to z-score of BMI for age. No child was belonging to overweight or obese category and26.8% were thin. It was found that proportion of undernourished children was evenly distributed through-out the age group of 6-15 years and it was significantly higher in boys. Fazili A et al (2012)[22] study reported overall prevalence of thinness as 29.0%, also they did not find any significant difference between males and females. Mandal S et al study (2014)[20] found among 5-14 years aged children, 48% showed thinness. Finding was different from our study.

Conclusion
Current study on nutritional assessment was conducted among children of 5-14 years in the covered rural areas of Kanpur. Mean age with standard deviation of boys and girls were respectively 10.55±2.66 years and 9.94±2.68 years. Mean weight for age of normal Weight and under weight children were 30.95±8.37 Kg and 19.61±3.61 Kg respectively. Education of parents has positive effect on Weight for Age of children. Majority of underweight for age children were of illiterate parents (Father 37.2%, Mother 39.9%), lower class family (35.6%) and Joint Family 35%. Underweight for Age of boys and girls were mostly of 8 yrs. age group viz. 47.5%and 56.0% respectively. Underweight girls were also of 13 years age (43.3%).

The study shows undernourished children were found to be significantly associated with age, sex and education of

the parents, socioeconomic class of the family and type of the family. It was significantly higher in females, age of puberty, children of uneducated mothers or of lower class family or belonging to joint family. Majority of underweight/stunted/thinness (BMI<-2SD) was found in children of 8 and 9 years of age group.

Present study shows overall prevalence of underweight, stunting and thinness (BMI<-2SD) for age/sex among children were 27.8%, 22.9% and 22% respectively. Study also concluded that prevalence of under nutrition was found to be higher among females as compared to males, according to weight for age, height for age and BMI <-2SD. This may be due to gender indiscrimination, seen more in rural areas. It is seen that growth spurt starts earlier in females than males. So there is extra caloric demand in girls, if it is not fulfilled, may result in under nutrition.

Recommendation
Inspite of running number of nutritional programme, robust mid-day meal programme, undernutrition is still prevalent among children. Emphasis should be paid to correct the loop holes of the running program. There is need of regular nutritional assessment of children at frequent intervals in school and at community level. Health education should be added in the school curriculum and it is needed to raise the maternal literacy particularly related to health care seeking behavior and attitude towards children health care.

Source of Funding

Conflict of Interest
None.

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