

Effect of health education among mothers related to lead poisoning in children residing at selected urban regions of Maharashtra

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Abstract—Lead poisoning is a significant environmental health problem that adversely affects the physical, cognitive, and behavioural development of children. Mothers play a vital role in preventing lead exposure through early identification of risk factors and implementation of preventive measures. Therefore, enhancing mothers' knowledge through health education is essential for the prevention of childhood lead poisoning. The present study was conducted to assess the effect of health education among mothers regarding lead poisoning in children residing in selected urban regions of Maharashtra.

A quantitative research approach with a true experimental randomized control group design was adopted. The study included 210 mothers (105 in the experimental group and 105 in the control group) selected through simple random sampling from two selected urban regions of Maharashtra. Data were collected using a health education consisting of demographic variables and knowledge questions related to lead poisoning in children. Following the pretest, health education was administered to the experimental group, while the control group received no intervention. A post-test was conducted after seven days using the same tool to evaluate the effectiveness of the intervention. The findings revealed that both groups had comparable demographic characteristics before the intervention. Pretest knowledge levels regarding lead poisoning in children were similar in the experimental and control groups. Following the health education intervention, the experimental group demonstrated a marked improvement in knowledge, whereas the control group showed only minimal change. The difference between pretest and post-test knowledge scores in the experimental group was statistically highly significant ($p < 0.0001$), confirming the effectiveness of the health education programme. Significant associations were observed between posttest knowledge scores and selected

demographic variables, including age, educational status, and source of information, whereas no significant association was found with other selected variables.

The study concludes that health education is an effective intervention for improving mothers' knowledge regarding lead poisoning in children. The findings highlight the importance of health education in increasing awareness, promoting preventive practices, and reducing the risk of lead poisoning among children. The study recommends incorporating regular health education sessions into community health services to enhance mothers' knowledge and contribute to better child health outcome.

Index Terms—health education, knowledge scores, lead poisoning in children, mothers

I. INTRODUCTION

Indian children account for one-third of the 800 million children suffering from lead poisoning globally. Lead poisoning is one of the most common diseases due to chronic exposure to an environmental toxin. A blood lead level $>5 \mu\text{g/dL}$ is considered toxic; children in more than 23 states in our country show average levels exceeding this cut-off. Lead poisoning is characterized by fatigue, recurrent abdominal pain, vomiting, constipation or diarrhea, anorexia, anemia, a dark line along the gums, and weakness of limbs. Patients show anemia, hypertension, raised intracranial pressure, kidney dysfunction and toxicity to the immune and reproductive systems. Children below 6 years are especially vulnerable, with profound effects on intelligence, and mental and physical development. Exposure during pregnancy can cause miscarriage, stillbirth, premature birth and low birth

weight.¹ Around 600,000 new cases of intellectually impaired children are caused by childhood lead exposure each year, which continues to be a major health issue for officials worldwide. The majority of children who are exposed to high levels of lead reside in low- and middle- income nations. In India, the phase-out of leaded gasoline was finished in 2000. However, in 2020, an estimated 275 million children between the ages of 0 and 9 had blood lead levels (BLLs) $\geq 5 \mu\text{g/dL}$, which are known to negatively impact behaviour and cognitive. Spices, cookware, paint, traditional medicines and cosmetics, and the recycling and repair of lead-acid batteries are among the lead sources that have been documented in India. Their respective contribution hasn't been described, though. More than 200 lead pollution sites related to battery recycling and repair activities were identified in Bihar and Jharkhand, India. Ninety percent of the recycling sites had soil lead concentrations exceeding the US Environmental Protection Agency's standards.

2

II. OBJECTIVES

The objectives of study are;

- To assess the knowledge among mothers related to lead poisoning belonged to experimental and control group before intervention.
- To assess the effect of health education among mothers related to lead poisoning in children

between pre test and post test knowledge scores in control and experimental group.

III. MATERIALS AND METHODS

A quantitative approach was adopted and randomized experimental and control group design was used for this study. The study was carried out in the selected urban region of Maharashtra. The permission was obtained from authorities concerned Nagarsevak of selected urban regions. The randomized sampling technique was used to select 210 mothers (105 in the control and 105 in the experimental group) residing in urban regions of Maharashtra. Written consent was obtained from the samples and pre-test has been assessed for all the 210 mothers from experimental and control group using structured interview schedule (SIS) for assessing knowledge. Then the health education was given for all mothers residing in urban regions to whom the pre-test was conducted. After 7 days, the post test was taken and the data was analyzed. Statistical Analysis- The data was analyzed by descriptive and inferential statistics. Demographic data was analyzed using frequency and percentage, data from the questionnaire before and after health education administered was also analyzed using frequency, percentage and 't' test. The association between knowledge findings and demographic variables was found by using t test and chi-square test.

IV. RESULTS

Table 1: percentage wise distribution of Mothers according to their demographic characteristics. n=210

Demographic Variables	Experimental Group(n=105)	Control Group(n=105)
Age(yrs)		
19-23 yrs	37(35.2%)	36(34.3%)
24-28 yrs	39(37.1%)	35(33.3%)
29-33 yrs	14(13.3%)	21(20%)
≥ 34 yrs	15(14.3%)	13(12.4%)
Educational Status		
Illiterate	4(3.8%)	5(4.8%)
Primary	26(24.8%)	26(24.5%)
Secondary	36(34.3%)	35(33.3%)
Higher Secondary	11(10.5%)	17(16.2%)
Degree and above	28(26.7%)	22(21%)
Per Capita Income(Rs)		
≤ 10000 Rs	20(19%)	18(17.1%)

10001-20000 Rs	15(14.3%)	23(21.9%)
20001-30000 Rs	32(30.5%)	34(32.4%)
>30000 Rs	38(36.2%)	30(28.6%)
Type of family		
Joint	32(30.5%)	30(28.6%)
Nuclear	33(31.4%)	40(38.1%)
Single Parent	22(21%)	15(14.3%)
Extended	18(17.1%)	20(19%)
Source of information		
Television	32(30.5%)	34(32.4%)
Mass Media	35(33.3%)	31(29.5%)
Healthcare Provider	26(24.8%)	28(26.7%)
Any Other	12(11.4%)	12(11.4%)

Table 2: Significance of difference between knowledge scores in pre and post test of mothers of experimental group

n= 105

Test	Mean	SD	Mean Difference	t-value	p-value
Pre Test	3.85	1.41	8.82±3.52	25.67	0.0001
Post Test	12.68	3.18			S,p<0.05

This table shows the comparison of pretest and post test knowledge scores of mothers regarding lead poisoning in children residing at selected urban region of Maharashtra State. Mean, standard deviation and mean difference values are compared and student's paired 't' test is applied at 5% level of significance. The tabulated value for n=105-1 i.e. 104 degrees of freedom was 1.98. The calculated 't' value i.e. 25.67 are much higher than the tabulated value at 5% level

of significance for overall knowledge score of Mothers which is statistically acceptable level of significance. Hence it is statistically interpreted that the Health Education on knowledge regarding lead poisoning in children among Mothers residing at selected urban region of Maharashtra State was effective. Thus the H₁ is accepted.

Table 3: Significance of difference between knowledge score in pre and post test of Mothers of Control Group

n=105

Test	Mean	SD	Mean Difference	t-value	p-value
Pre Test	3.85	1.41	4.77±2.24	21.77	0.0001
Post Test	8.62	1.94			S,p<0.05

This table shows the comparison of pretest and post test knowledge scores of mothers regarding lead poisoning in children residing at selected urban region of Maharashtra State. Mean, standard deviation and mean difference values are compared and student's paired 't' test is applied at 5% level of significance. The tabulated value for n=105-1 i.e. 104 degrees of freedom was 1.98. The calculated 't' value i.e. 21.7 are much higher than the tabulated value at 5% level of

significance for overall knowledge score of Mothers which is statistically acceptable level of significance. Hence it is statistically interpreted that the Health Education on knowledge regarding lead poisoning in children among Mothers residing at selected urban region of Maharashtra State was effective. Thus the H₁ is accepted.

Table 4: significance of mean difference between knowledge scores in pre and post test of mothers of experimental and control group

n= 210

Group	Mean	SD	t-value	p-value
Experimental Group	8.82	3.52	9.95	0.0001
Control Group	4.77	2.24		S,p<0.05

This table shows the comparison of mean difference pretest and post test knowledge scores of Mothers regarding lead poisoning in children residing at selected urban region of Maharashtra State in experimental and control group. Mean, standard deviation and mean difference values are compared and student's unpaired 't' test is applied at 5% level of significance. The tabulated value for $n=105+105-2$ i.e. 208 degrees of freedom was 1.96. The calculated 't' value i.e. 9.95 are much higher than the tabulated value at 5% level of significance for overall knowledge score of Mothers which is statistically acceptable level of significance. Hence it is statistically interpreted that the Health Education on knowledge regarding lead poisoning in children among mothers residing at selected urban region of Maharashtra State was effective in experimental group. Thus the H₂ is accepted.

V. DISCUSSION

The present study revealed that the baseline knowledge of mothers regarding lead poisoning in children was markedly inadequate. In the pre-test assessment, 90.48% of mothers in the experimental group and 100% in the control group demonstrated poor knowledge, with mean pre-test knowledge scores of 3.85 ± 1.41 and 3.14 ± 1.41 , respectively. These findings are in agreement with studies conducted by Sharma and Reddy, who reported that more than 85% of mothers had insufficient baseline knowledge regarding childhood lead exposure. Similarly, a study by Bellinger emphasized that lack of maternal awareness remains a major public health concern contributing to continued lead exposure among children in urban settings. Following the structured health education programme, a substantial improvement in knowledge was observed among mothers in the experimental group. The mean post-test knowledge score increased to 12.68 ± 3.18 , with 31.43% of mothers achieving a very good level of

knowledge, while none remained in the poor category. In contrast, the control group achieved a lower mean post-test score of 8.62 ± 1.94 , and 1.90% of mothers continued to exhibit poor knowledge. These findings are consistent with the work of Gupta et al., who demonstrated that planned teaching programmes significantly improve maternal knowledge, with post-test scores increasing from low baseline levels to moderate or good levels following intervention. Likewise, Needleman reported that educational interventions play a crucial role in improving caregiver awareness regarding lead toxicity and its prevention. The effectiveness of health education in the present study was further supported by statistical analysis. The experimental group showed a mean knowledge gain of 8.82 ± 3.52 , with a highly significant paired t value of 25.67 ($p = 0.0001$), whereas the control group showed a comparatively lower mean gain of 4.77 ± 2.24 . These results align closely with findings reported by Suryavanshi and Patil, who documented a statistically significant improvement in post-test knowledge scores among mothers following structured health education, with t values exceeding 20.0. Such findings consistently highlight the effectiveness of planned educational interventions in improving maternal knowledge related to child health hazards. A comparison between the experimental and control groups revealed a statistically significant difference in knowledge gain, with an unpaired t value of 9.95 ($p = 0.0001$). This finding confirms that the improvement observed in the experimental group was directly attributable to the health education intervention. Similar results were reported by Kaur and Singh, who found significantly higher post-intervention knowledge scores in experimental groups compared to control groups, reinforcing the importance of structured educational strategies in community health nursing practice. The present study also identified significant associations between post-test knowledge scores and selected demographic variables, namely age and educational

status. Mothers aged 34 years and above obtained the highest mean post-test score (15.60 ± 3.06), and the association was statistically significant ($F = 6.50$, $p = 0.0001$). Educational status also showed a significant association ($F = 3.29$, $p = 0.014$), with mothers educated up to the higher secondary level achieving the highest scores. These findings are supported by studies conducted by Rosen and Schwartz, who reported that maternal age and education positively influence comprehension and retention of health education content. Conversely, similar to the present study, researchers such as Patra et al. found no significant association between maternal knowledge and variables like income, family type, or source of information. Overall, the discussion of findings demonstrates that the results of the present study are consistent with existing national and international studies. The significant improvement in post test knowledge scores, high t values, and meaningful associations with demographic variables confirm that structured health education is an effective and essential intervention for improving mothers' knowledge regarding lead poisoning in children.

VI. CONCLUSION

The study concluded that Health Education was highly effective in improving mothers' knowledge regarding lead poisoning in children. Mothers who received the educational intervention achieved significantly higher post-test knowledge scores than those in the control group, demonstrating the positive impact of structured health education. The findings emphasize the importance of incorporating regular educational programs on lead poisoning prevention into community and maternal-child health services to enhance awareness, promote early preventive practices, and reduce the risk of lead exposure among children.

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