



“A STUDY TO EVALUATE THE EFFECTIVENESS OF INFORMATION BOOKLET REGARDING VITAMIN-A DEFICIENCY AND ITS PREVENTION AMONG MOTHERS OF UNDER FIVE CHILDREN IN SELECTED SLUM AREAS, REWA”

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Abstract: Background: Vitamin A deficiency remains a major cause of preventable childhood blindness and of infection-related illness and death in children under five years, and the knowledge of mothers is central to its prevention. Despite more than three decades of a national prophylaxis programme in India, deficiency persists among poor and underprivileged populations.

Objectives: To assess the pre-test and post-test knowledge of mothers of under-five children regarding vitamin A deficiency and its prevention, to determine the effectiveness of an information booklet, and to find the association between knowledge and selected socio-demographic variables.

Methods: A quantitative, pre-experimental, one-group pretest–posttest study was conducted in selected slum areas of Rewa, Madhya Pradesh, in April 2023. Fifty mothers of under-five children were recruited by non-probability convenience sampling. Data were collected with a self-structured questionnaire on eight socio-demographic characteristics and a 30-item multiple-choice knowledge questionnaire (maximum score 30; poor 0–10, average 11–20, good 21–30). An information booklet was given after the pre-test, and the post-test was administered on the seventh day with the same tool. Data were analysed with frequencies, percentages, means, standard deviations, the paired *t*-test and the chi-square test.

Results: Before the booklet, 64.0% (*n* = 32) of mothers had poor knowledge, 28.0% (*n* = 14) average and 8.0% (*n* = 4) good knowledge. After the booklet, no mother had poor knowledge, 20.0% (*n* = 10) had average and 80.0% (*n* = 40) had good knowledge. The mean knowledge score increased from 12.52 ± 3.23 to 24.75 ± 2.33 (mean gain 12.23; paired *t* = 3.77, *df* = 49, *p* < 0.001). Pre-test knowledge was significantly associated with the number of under-five children, educational status and source of health information, but not with age, family income, occupation, type of family or housing condition.

Conclusion: Baseline knowledge of vitamin A deficiency and its prevention was poor among mothers in the study area. An information booklet was followed by a significant improvement in knowledge. Validated, illustrated written material may be a practical way of educating mothers in slum communities; because the design lacked a control group and followed mothers for only seven days, the findings should be confirmed in controlled studies with longer follow-up.

Keywords: vitamin A deficiency; information booklet; knowledge; mothers; under-five children; slum area; India

1. Introduction

Vitamin A is a fat-soluble micronutrient that is essential for vision, growth and development, immune function and reproduction. As a component of rhodopsin it is required for vision in dim light, and it maintains the epithelial lining of the conjunctiva, cornea and respiratory and urinary tracts. Deficiency produces night blindness, conjunctival xerosis and Bitot's spots and, in severe cases, corneal ulceration, keratomalacia and blindness; it also impairs growth and increases susceptibility to diarrhoeal and respiratory infection. Children under five years are especially vulnerable because their

requirements are high, their growth is rapid and their exposure to infection is frequent.

Vitamin A deficiency remains a public health problem across the developing world and usually occurs together with malnutrition and chronic intestinal disorders among poor and underprivileged populations. In 2013 the World Health Organization classified it as a public health problem affecting about one third of children aged 6–59 months. Global estimates describe roughly 127 million deficient preschool children, 4.4 million preschool children with



xerophthalmia and about 6 million women with night blindness during pregnancy [1].

India is among the countries with the highest prevalence of clinical and subclinical deficiency. According to the World Bank (2007), clinical deficiency affects fewer than 1% of children in India, but biochemical, subclinical deficiency is common. A community-based cross-sectional study of 8,777 pre-school children in rural Madhya Pradesh found night blindness in 0.8% and Bitot's spots in 1.4%, and 88% of the children had serum vitamin A below 20 µg/dl; Bitot's spots were significantly commoner among children from lower socio-economic communities, children aged 3–5 years and children of illiterate mothers.

India launched the National Prophylaxis Programme against Nutritional Blindness due to Vitamin A Deficiency in 1970. It was revised under the Child Survival and Safe Motherhood programme in 1994, with coverage aimed at children aged 9–36 months, and in 2006 the eligible age range was widened to 6–59 months in line with WHO and UNICEF recommendations. Coverage has nevertheless remained limited. The National Family Health Survey of 2005–06 found that only 18% of children aged 6–59 months had received a vitamin A dose in the preceding six months, and the third District Level Household Survey (2007–08) reported that only 19% of children aged 12–35 months had received three to five doses. Prevention also depends on diets that include carotene-rich cereals, tubers, vegetables and fruits, on home gardening, and on timely use of the prophylaxis programme.

Mothers are the principal caregivers of young children and the key link between these measures and the child, yet studies of maternal awareness show important gaps. In Rajkot district, Gujarat, only 18.9% of surveyed mothers were aware of the vitamin A prophylaxis programme and 27.4% included vitamin A-rich foods in their children's diets, with the poorest results among illiterate mothers (Seth and colleagues). Health education can narrow such gaps. An information booklet, a written, validated guide supported by pictures, is a simple educational tool that mothers can read at their own pace and keep for later reference. The present study was undertaken to evaluate its effect on the knowledge of mothers of under-five children in selected slum areas of Rewa, Madhya Pradesh.

The objectives were: (1) to assess the pre-test knowledge score regarding vitamin A deficiency and its prevention among mothers of under-five children; (2) to assess the post-test knowledge score; (3) to determine the effectiveness of the information booklet; and (4) to find the association between the level of knowledge and selected socio-demographic variables. The research hypotheses

were H₁, that there is a significant difference between pre-test and post-test knowledge scores, and H₂, that there is a significant association between pre-test knowledge and selected socio-demographic variables.

2. Methods

2.1 Study design and setting

A quantitative approach with a pre-experimental, one-group pretest–posttest design was used. The design can be represented as O₁ X O₂, where O₁ is the pre-test knowledge score, X is the information booklet and O₂ is the post-test knowledge score. The independent variable was the information booklet and the dependent variable was the knowledge of mothers regarding vitamin A deficiency and its prevention. The conceptual framework was derived from General Systems Theory [2], in which mothers were regarded as an open system: input (the mothers and their socio-demographic characteristics), process (development of the questionnaire and booklet, pre-test, booklet and post-test on the seventh day, and data analysis) and output (the knowledge level of mothers, graded as good, average or poor). Re-evaluation, which would provide feedback to the system, was not part of the study objectives. The study was conducted in selected slum areas of Rewa, Madhya Pradesh, India, and data were collected in April 2023.

2.2 Participants and sampling

The target population was mothers of under-five children living in the selected slum areas of Rewa. Fifty mothers who met the selection criteria were enrolled by non-probability convenience sampling. Mothers were included if they were willing to participate, were available during the period of data collection and could read Hindi and English. Mothers who were unwilling, unavailable or unable to read Hindi and English were excluded. No formal sample-size calculation is reported. Selection was non-random, and the sample cannot be assumed to represent all mothers in the area.

2.3 Instruments

Data were collected with a self-structured, self-reported paper-and-pencil tool in two parts. **Part I** recorded eight socio-demographic characteristics: age (20–24, 25–29, 30 years and above), number of under-five children (1, 2, 3 or more), educational status (primary, secondary, graduation), monthly family income (up to Rs 10,000, Rs 10,001–20,000, above Rs 20,000), occupational status (government job, private job, housewife), type of family (nuclear, joint), housing condition (pucca, semi-pucca, kachha) and source of health information (television, mobile phone, health care provider).



Part II was a structured knowledge questionnaire of 30 multiple-choice items on the requirements, sources, deficiency and prophylaxis of vitamin A among under-five children. Each correct answer scored one mark and each incorrect answer zero, giving a possible range of 0–30. Scores were graded as poor (0–10), average (11–20) or good (21–30). A blueprint distributed the items by cognitive level: knowledge-based 50%, comprehension-based 23% and application-based 27%.

2.4 Validity, reliability and pilot study

For content validity, the tool, together with the objectives, problem statement, hypotheses, operational definitions, blueprint, answer key and criteria checklist, was given to six experts in community health nursing and mental health nursing. They judged the appropriateness and relevance of each item (agree or disagree, with space for remarks). Agreement was 90% on all items, and the tool was modified according to their suggestions before the pilot study. The tool was translated into Hindi and back-translated into English to establish language validity. Reliability was established in a pilot study of six mothers by the split-half method, and the coefficient calculated with Karl Pearson's formula was $r = 0.83$, which was considered sufficient. The pilot study was carried out in selected slum areas of Rewa from 15 to 25 February 2023, using the same procedure as the main study. Mothers took 30–40 minutes to complete the questionnaire, and the tool and procedure were found effective and practicable.

2.5 Intervention: information booklet

The intervention was a written, illustrated information booklet on vitamin A deficiency and its prevention among under-five children, which was validated by experts and edited in English and Hindi. It set out its objectives (to introduce and define vitamin A, list its sources, describe the requirement, enumerate toxicity and deficiency, list prevention measures and explain the National Vitamin A Prophylaxis Programme) and covered the magnitude of the problem, the two principal forms of dietary vitamin A (retinol and provitamin A carotenoids), animal and plant sources, recommended daily amounts by life stage, the features of toxicity, the ocular and extraocular manifestations of deficiency, dietary and community measures for prevention (including breastfeeding, periodic high-dose supplementation and home gardening) and the national prophylaxis schedule.

2.6 Data collection procedure

Written permission was obtained from the concerned authority before data collection. Data were collected from 10 to 17 April 2023. The investigator explained the purpose of the study to the

mothers, assured them of confidentiality and identified each questionnaire by a code number. On the first day, mothers completed the socio-demographic questionnaire and the knowledge questionnaire (pre-test), and the information booklet was given to them on the same day. On the seventh day, the post-test was conducted with the same knowledge questionnaire. All 50 mothers were included in the analysis.

2.7 Ethical considerations

Permission was obtained from the concerned authority, and mothers were given a consent form that stated the purpose of the study. Confidentiality was assured, questionnaires were identified by code numbers, and the information was used only for research purposes.

2.8 Data analysis

A master data sheet was prepared. Socio-demographic characteristics were summarised as frequencies and percentages, and knowledge scores as means and standard deviations (SD). The difference between pre-test and post-test mean scores was tested with the paired t -test ($df = 49$). Associations between pre-test knowledge level (poor, average, good) and the socio-demographic variables were examined with the chi-square test. The level of significance was set at $p < 0.05$. The mean gain and the scores expressed as a percentage of the maximum were calculated from the reported means and are labelled as derived values.

3. Results

3.1 Characteristics of participants

All 50 mothers were included in the analysis (Table 1). Half of the mothers (50.0%) were aged 20–24 years and 46.0% were aged 25–29 years; only two (4.0%) were aged 30 years or above. Most mothers (84.0%) had one under-five child and 16.0% had two. Secondary education was the commonest level (40.0%), followed by graduation (36.0%) and primary education (24.0%). More than half of the families (54.0%) had a monthly income of Rs 10,001–20,000, while 26.0% earned up to Rs 10,000 and 20.0% earned more than Rs 20,000. Nearly two-thirds of the mothers (64.0%) were housewives, 24.0% held a private job and 12.0% a government job. Over half (56.0%) lived in joint families, and 60.0% lived in pucca, 28.0% in semi-pucca and 12.0% in kachha houses. The mobile phone was the commonest source of health information (52.0%), followed by television (28.0%) and health care providers (20.0%) (Figure 1).



Table 1. Socio-demographic characteristics of the mothers (N = 50)

Variable	Frequency (n)	Percentage (%)
Age group (years)		
20–24	25	50.0
25–29	23	46.0
30 and above	2	4.0
Number of under-five children		
1	42	84.0
2	8	16.0
3 or more	0	0.0
Educational status		
Primary	12	24.0
Secondary	20	40.0
Graduation	18	36.0
Monthly family income (Rs)		
Up to 10,000	13	26.0
10,001–20,000	27	54.0
Above 20,000	10	20.0
Occupational status		
Government job	6	12.0
Private job	12	24.0
Housewife	32	64.0
Type of family		
Joint	28	56.0
Nuclear	22	44.0
Housing condition		
Pucca	30	60.0
Semi-pucca	14	28.0
Kachha	6	12.0
Source of health information		
Television	14	28.0
Mobile phone	26	52.0
Health care provider	10	20.0

Percentages were calculated from the frequencies and rounded to one decimal place.

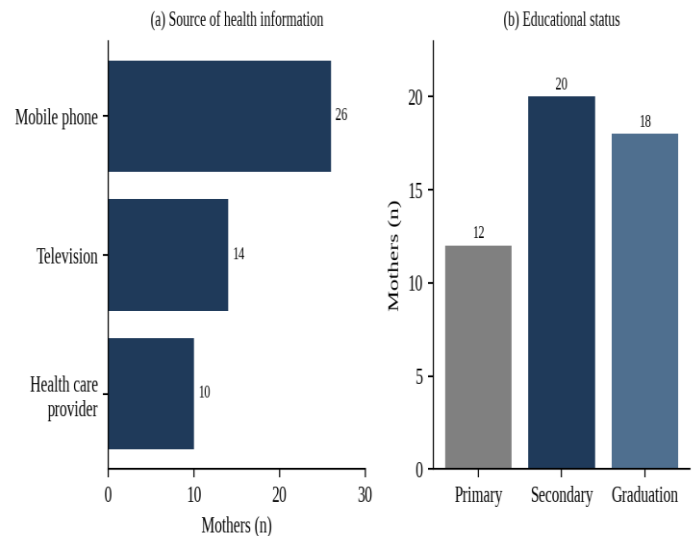


Figure 1. (a) Source of health information and (b) educational status of the mothers (N = 50).

3.2 Level of knowledge before and after the information booklet

In the pre-test, 32 mothers (64.0%) had poor knowledge, 14 (28.0%) had average knowledge and 4 (8.0%) had good knowledge. In the post-test, no mother had poor knowledge, 10 (20.0%) had average knowledge and 40 (80.0%) had good knowledge (Table 2, Figure 2). Every mother who had poor knowledge before the booklet moved to a higher category afterwards.

Table 2. Distribution of mothers by level of knowledge regarding vitamin A deficiency and its prevention, before and after the information booklet (N = 50)

Level of knowledge	Pre-test, n (%)	Post-test, n (%)
Poor (0–10)	32 (64.0)	0 (0.0)
Average (11–20)	14 (28.0)	10 (20.0)
Good (21–30)	4 (8.0)	40 (80.0)
Total	50 (100)	50 (100)

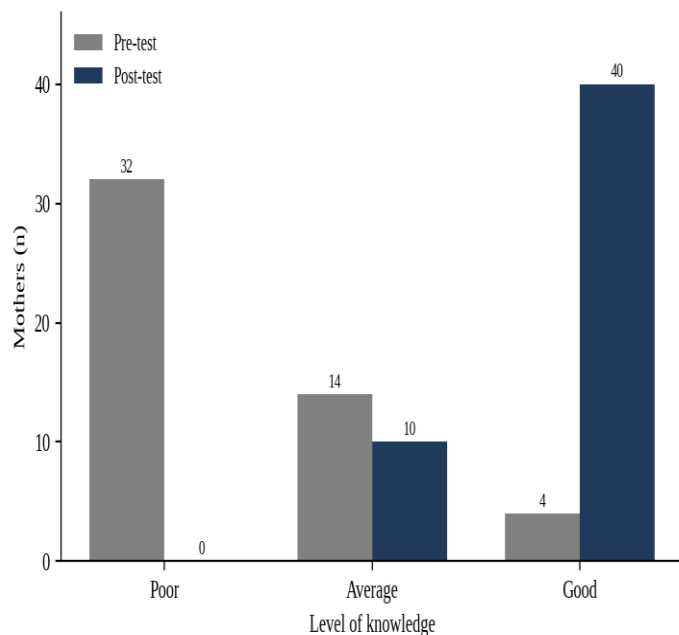


Figure 2. Level of knowledge regarding vitamin A deficiency and its prevention before and after the information booklet (N = 50).

3.3 Effectiveness of the information booklet

The mean knowledge score rose from 12.52 (SD 3.23) before the booklet to 24.75 (SD 2.33) afterwards, a mean gain of 12.23 points (Table 3, Figure 3). Expressed against the maximum score of 30, mean knowledge increased from 41.7% to 82.5%. Scores were also less dispersed after the booklet (SD 2.33 compared with 3.23). The paired *t*-test gave *t* = 3.77 with 49 degrees of freedom, a difference significant at *p* < 0.05 (and below 0.001). The research hypothesis *H*₁ was therefore accepted.

Table 3. Comparison of mean pre-test and post-test knowledge scores (N = 50)

Measure	Pre-test	Post-test	Mean gain	Paired <i>t</i> -test
Mean score (maximum 30)	12.52	24.75	12.23	<i>t</i> = 3.77
Standard deviation	3.23	2.33	–	df = 49
Mean score (% of maximum)	41.7	82.5	40.8	<i>p</i> < 0.001 (significant)

Mean gain and the percentage values are derived from the reported means. Percentages of the maximum score are rounded to one decimal place.

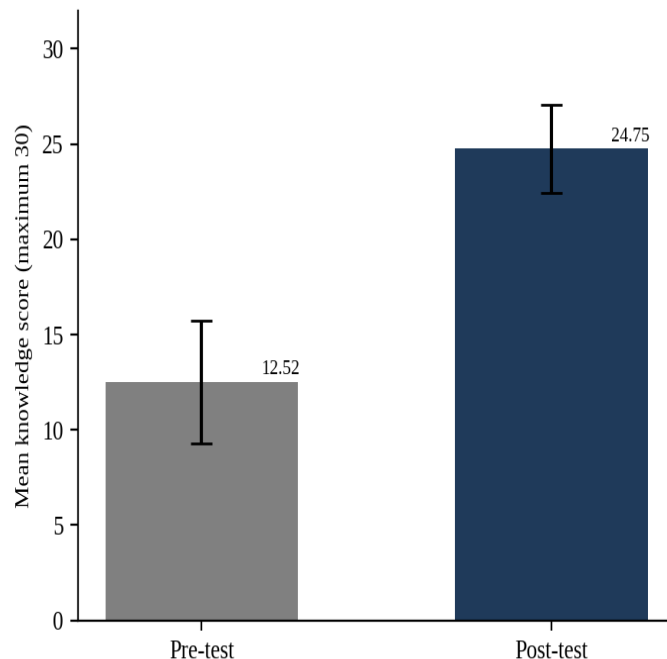


Figure 3. Mean knowledge scores before and after the information booklet. Error bars show one standard deviation.

3.4 Association of knowledge with socio-demographic variables

Pre-test knowledge level was significantly associated with the number of under-five children ($\chi^2 = 12.618$, *df* = 4, *p* = 0.013), educational status ($\chi^2 = 78.095$, *df* = 4, *p* < 0.001) and source of health information ($\chi^2 = 6.706$, *df* = 4, *p* < 0.001) (Table 4). No significant association was found with age, monthly family income, occupational status, type of family or housing condition. The research hypothesis *H*₂ was therefore accepted for the three variables that showed an association. Descriptively, 30 of the 42 mothers (71.4%) with one under-five child had poor pre-test knowledge, compared with 2 of 8 mothers (25.0%) with two children; all 12 mothers with primary education had poor knowledge, compared with 4 of 18 graduates; and 3 of the 10 mothers who obtained health information from a health care provider had good knowledge, compared with none of the 14 who relied on television.



Table 4. Association between pre-test knowledge level and selected socio-demographic variables (N = 50)

Variable	χ^2	df	p	Inference
Age	4.018	4	0.674	Not significant
Number of under-five children	12.618	4	0.013	Significant
Educational status	78.095	4	< 0.001	Significant
Monthly family income	11.215	4	0.082	Not significant
Occupational status	4.297	4	0.117	Not significant
Type of family	7.761	2	0.101	Not significant
Housing condition	4.108	4	0.114	Not significant
Source of health information	6.706	4	< 0.001	Significant

Significance was set at $p < 0.05$. Several cells had expected counts below 5, so these results should be interpreted with caution.

4. Discussion

This study evaluated the effect of an information booklet on the knowledge of mothers of under-five children regarding vitamin A deficiency and its prevention in selected slum areas of Rewa. The main findings were that baseline knowledge was poor in nearly two-thirds of the mothers, that knowledge improved significantly a week after the booklet with no mother remaining in the poor category, and that baseline knowledge was associated with the number of under-five children, educational status and source of health information.

4.1 Baseline knowledge

At baseline, 64.0% of the mothers had poor knowledge and only 8.0% had good knowledge. This agrees with earlier studies of mothers. In an urban slum of Raichur, 90% of mothers had inadequate knowledge before teaching [3]; in Kolar, 76.7% of mothers of preschool children had inadequate knowledge and none had adequate knowledge [4]; among 100 mothers in Aikkaranadu Grama Panchayat, only 6% had adequate knowledge (Verghese and colleagues, 2019); and in Rajkot, fewer than one in five mothers knew of the prophylaxis programme (Seth and colleagues). Poor maternal knowledge therefore appears to be widespread, and it is particularly worrying in a country that has run a prophylaxis programme for more than 30 years.

The sources of information deserve comment. The mobile phone (52.0%) and television (28.0%) were the main sources, and only 20.0% of mothers obtained health information from a health care

provider. By contrast, in a study of mothers at a hospital in Nairobi, 94% had heard of vitamin A and health workers were the main source of information (82%) [5]. Mobile phones and television seldom convey specific, reliable guidance on vitamin A requirements, sources and prophylaxis, and this may partly explain the poor baseline knowledge observed here.

4.2 Effect of the information booklet

The mean score rose from 12.52 to 24.75, equivalent to an increase from 41.7% to 82.5% of the maximum score, and 80.0% of mothers reached good knowledge after the booklet. Similar gains have been reported in other pre-experimental studies. A study of 50 mothers in Tamil Nadu found a mean difference of 15.58 between pre-test and post-test scores ($t = 36.23$, $p < 0.05$) [6]. Ganvir [7] and Khatri [3] likewise found significant differences between pre-test and post-test knowledge after planned or structured teaching, the latter reporting $t = 10.28$ ($p \leq 0.01$), and in a booklet-based study of 30 mothers in Lucknow the proportion with average knowledge rose from 60% to 76% (Singh, 2021).

Several features of the intervention may have contributed. The booklet was written, illustrated and validated by experts, it was available in English and Hindi, its content matched the topics assessed, and mothers could re-read it at home. The smaller standard deviation after the booklet (2.33 compared with 3.23) suggests that it brought mothers to a more uniform level of knowledge.

The size of the gain should nonetheless be interpreted with caution. The post-test used the same questionnaire as the pre-test and was given only seven days after the booklet, so part of the improvement may reflect recall of the items and familiarity with the test rather than durable learning. There was no control group, so other influences on knowledge during the week cannot be excluded. The study measured knowledge only; it did not examine whether mothers fed their children more vitamin A-rich foods or used the supplementation programme.

4.3 Association with socio-demographic variables

Mothers with one under-five child had poorer baseline knowledge than mothers with two. This may reflect greater experience of child care and contact with health services among mothers with more than one young child, although only eight mothers had two children and the finding needs confirmation. Education showed the clearest gradient: all mothers with primary education had poor knowledge, which is consistent with the higher frequency of Bitot's spots among children of illiterate mothers in rural Madhya Pradesh and with the poor results among illiterate mothers in Rajkot. Mothers who obtained information from health care providers fared better



than those who relied on television, which supports the role of direct contact with health workers.

Age, family income, occupation, type of family and housing condition were not significantly associated with knowledge. Findings elsewhere are mixed. Khatri [3] found a significant relationship with the occupation of parents but none with maternal age, parental education, number of children, family type or income, and the Lucknow booklet study found no significant association with socio-demographic variables (Singh, 2021). Differences in setting, sample size and categories used may account for these differences, and with 50 mothers spread across several categories the cells available for chi-square testing were small.

4.4 Strengths and limitations

Strengths of the study include a tool that was validated by six experts, translated and back-translated, and pilot-tested with acceptable reliability ($r = 0.83$); a standardised, expert-validated booklet; a one-week interval that allowed mothers time to read it; and the combination of knowledge scores and socio-demographic data in the same group. Several limitations should be noted. The sample was small (50 mothers), was drawn by convenience sampling from selected slum areas of one city, and cannot be generalised to other settings. The one-group pretest–posttest design had no control group, the same questionnaire was used before and after the booklet, and follow-up was limited to seven days, so retention could not be assessed. Only mothers who could read Hindi and English were included, so the findings may not apply to non-literate mothers, who are at greatest risk. Reliability was estimated in a pilot of only six mothers. Many cells in the cross-tabulations had small expected counts, which limits the chi-square results.

4.5 Implications

The findings carry implications for several areas of nursing. For general education and community health, the poor baseline knowledge supports including vitamin A requirements, sources, deficiency and prophylaxis in health education for mothers. For nursing education, the topic should be emphasised so that students understand its preventive aspect, and nurses in clinical settings should receive in-service and continuing education on it. For nursing administration, in-service education, health education programmes delivered by innovative methods and evaluation of the effectiveness of these programmes should be encouraged. For nursing practice, nurses can conduct street plays to raise awareness and can initiate regular guidance and counselling in hospital and community settings. Because knowledge alone does not ensure intake, education can also be paired with food-based

measures such as home gardening [8] and the introduction of orange-fleshed sweet potato, which increased vitamin A intake and serum retinol in young children in rural Mozambique [9]. For nursing research, the study provides baseline data from Rewa for future studies.

4.6 Recommendations for future research

Future studies should use larger samples and a control or comparison group, and should compare the booklet with other methods, such as a self-instructional module. They should include a delayed post-test to assess retention and should assess attitudes and practices, for example the consumption of vitamin A-rich foods and the uptake of the supplementation programme, so that the effect of education on behaviour can be measured rather than assumed. Comparative studies in other parts of the country, and among literate and non-literate mothers, would show how far the findings depend on culture and literacy; for non-literate mothers, pictorial or oral material may be needed.

5. Conclusion

Mothers of under-five children in the selected slum areas of Rewa had poor knowledge of vitamin A deficiency and its prevention at baseline, with 64.0% in the poor category. Baseline knowledge was significantly associated with the number of under-five children, educational status and source of health information. After mothers received an information booklet, knowledge improved significantly: the mean score rose from 12.52 to 24.75 out of 30, and no mother remained in the poor category. The results indicate that a validated, illustrated information booklet can improve short-term knowledge in this group. Because the study had no control group, a small convenience sample and only seven days of follow-up, the findings are preliminary. Future research should use larger, controlled designs, include delayed follow-up to assess retention, and measure practices as well as knowledge. Health education combined with continued access to the national prophylaxis programme can help mothers protect their children from vitamin A deficiency.

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Declarations

Ethics approval and consent: Written permission was obtained from the concerned authority before data collection, and mothers were given a consent form that stated the purpose of the study and



the confidentiality of their information. **Funding: Self-funded.**

Conflict of interest: No Conflict of interest. Data availability:

The master data sheet is available from the corresponding author on reasonable request.

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