FMDB *Transactions on Sustainable Social Sciences Letters*

Effectiveness of Learning Package on Protein Energy Malnutrition Among Mothers

P. Krishnaveni[1,*], D. Charmini Jeba Priya[2], P. Thenmozhi[3], Joseph Jeganathan[4], Suman Vashist[5], Nafees Ahmed[6]

[1]Department of Nursing, Markaz Rehabilitation Center, Riyadh, Saudi Arabia.
[2,3]Department of Nursing, Texcity College of Nursing, Coimbatore, Tamil Nadu, India.
[4]Department of Nursing, College of Health and Sport Sciences, University of Bahrain, Zallaq, Kingdom of Bahrain.
[5]Department of Mental Health Nursing, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India.
[6]Department of Medical-Surgical Nursing, College of Nursing, Teerthanker Mahaveer University, Uttar Pradesh, India.
krishnavenip801212@gmail.com[1], charms_mini@yahoo.co.in[2], mozhit81@yahoo.co.in[3], jjeganathan@uob.edu.bh[4], suman.nursing@tmu.ac.in[5], nafeesa.nursing@tmu.ac.in[6]

Abstract: Urban under-5s are especially affected by protein-energy malnutrition (PEM). Enhanced maternal knowledge through structured learning packages can enhance PEM prevention and management. This study examines the impact of a structured learning package on mothers' knowledge and practices about protein-energy malnutrition prevention and care in under-5s at the urban health centre in Podanur, Coimbatore. This study used a quantitative, pre-experimental one-group pretest-posttest. At the Urban Health Centre, Podanur, and Coimbatore, 30 mothers of under-5s were selected by convenient sampling. A verified 30-item self-administered knowledge test (rated 0–30). We deployed a structured learning package following the pretest and had a post-test one week later. Data analysis included frequency, percentage, mean, standard deviation, paired t-test, and chi-square test. Pretest results showed that 93.33% of moms had poor knowledge, and 6.67% had somewhat adequate knowledge.

Keywords: Learning Package; Protein-Energy Malnutrition; Urban Health Centre; Poor Sanitation; Environmental Factor; Socioeconomic Factor; Chronic Deficiencies; Living Conditions; Health Services.

Received on: 20/03/2024, **Revised on:** 10/06/2024, **Accepted on:** 28/07/2024, **Published on:** 05/09/2024

Journal Homepage: https://www.fmdbpub.com/user/journals/details/FTSSSL

DOI: https://doi.org/10.69888/FTSSSL.2024.000321

Cite as: P. Krishnaveni, D. C. J. Priya, P. Thenmozhi, J. Jeganathan, S. Vashist, and N. Ahmed, "Effectiveness of Learning Package on Protein Energy Malnutrition among Mothers," *FMDB Transactions on Sustainable Social Sciences Letters*., vol. 2, no. 3, pp. 171–182, 2024.

1. Introduction

Marasmus is a form of Protein Energy Malnutrition (PEM) resulting from chronic deficiencies in both protein and calories. It is characterized by symptoms such as sunken eyes, severe muscle wasting, prominent ribs, dry skin, subnormal temperature, growth retardation, irritability, and mental changes. Complications include growth issues, joint deformities, loss of strength, blindness, organ failure, and coma. Kwashiorkor, another type of PEM, occurs due to an inadequate protein intake. First

[*]Corresponding author.

described in 1932, it is marked by a distended abdomen, pedal oedema, changes in skin and hair colour (flag sign), dehydration, lack of muscle and fat, lethargy, irritability, hepatomegaly, and decreased immunity. If untreated, it can lead to coma, mental disabilities, and shock. Marasmic Kwashiorkor combines the features of both Marasmus and Kwashiorkor. Marasmus primarily affects children under one year, while kwashiorkor becomes more prevalent after 18 months. As children grow, their nutritional needs increase rapidly, and inadequate protein and calorie intake leads to PEM, particularly in infants and children under 18 months. In India, a significant number of children under 2 years do not consume a minimum acceptable diet due to inadequate breastfeeding and poor weaning practices. Socioeconomic factors such as poverty, ignorance, and unhygienic living conditions exacerbate PEM, especially in households with limited access to nutrition and healthcare. Maternal factors, including age, education, and nutritional status, also play a critical role. Additionally, repeated infections, poor sanitation, and environmental factors further contribute to malnutrition, with a higher prevalence in rural areas compared to urban areas [1]; [2].

Food and Nutrition Security Analysis in 2019 states that in 2015- 16, only 9.6% of children between 6 and 23 months consumed a minimum acceptable diet in India despite 94 per cent children receiving breast milk, milk, or milk products. Only 22 per cent of children had minimum dietary diversity, and 36 per cent had minimum meal frequency in India. Traditional practices and nutritional taboos influence malnutrition. Citrus fruits are believed to cause a common cold and cough. A habit of reserving egg and animal protein for infants, breastfeeding the infant and siblings at the same time, weaning from breastfeeding, and starting on a diet low in protein is still in practice. Socioeconomic factors such as poverty and ignorance cause unhygienic living conditions, inadequate food, and inadequate childcare. Children in poor households have limited access to food and health services, which makes them more susceptible to growth failures. Families with less family income and having more than three children are unable to meet the nutritional demands of growing children, which results in Protein Energy Malnutrition (PEM). The rapid succession of pregnancies and early inappropriate weaning before 6 months, artificial feeding with very dilute milk results in PEM.

Higher birth order children are very much prone to malnutrition. Maternal factors associated with undernutrition include age between 18 and 23years, height <145 cm, BMI <18.5, parent's education status, socioeconomic status, less birth order, small family size, no antenatal visits, poor nutrition during pregnancy, early initiation of breastfeeding within one-hour, exclusive breastfeeding for 6 months, premature weaning before 6 months and birth spacing less than 4 years [1]. A community-based study done to assess the maternal factors influencing nutrition among 310 three to six years old children in Devangere city, Karnataka, revealed that most malnourished children were born to mothers with less education, early marriage (<18 years gain (<10kg), and birth spacing (<2years). A mother’s nutritional and health status has critical importance in early child growth and development [6]. Environmental factors include repeated infections such as diarrhoea, which leads to loss of appetite, reduced food intake, and malabsorption of nutrients, resulting in reduced immunity, thereby increasing the body's demand for nutrients and leading to malnutrition, creating a vicious cycle of malnutrition and infection. Repeated respiratory infections and worm infestation due to poor sanitation lead to increased demand for energy, vitamins A and C, and other nutrients. The prevalence of malnutrition is higher in rural areas compared to urban areas [1].

1.1. Background of the Study

Malnutrition affects 88% of countries, with 29% experiencing all three forms: stunting, wasting, and underweight. Stunting is most prevalent in low-income countries, with India, Nigeria, and Pakistan leading in numbers. South Asia is home to 38.9% of the world’s stunted children, having the highest burden of the regions. Wasting and stunting are associated with increased mortality, especially when both are present in the same child. The report shows globally, 3.62% (15.95 million children) of under-fives are both stunted and wasted [5]. In 2019, 21.3% of children were stunted, and 6.9% were wasted. Wasting continues to threaten 47 million children globally, with 14.3 million severely wasted. Malnutrition is linked to high child mortality, and around 3.1 million children die annually due to undernutrition.

India and Nigeria contribute to about a third of these deaths. Malnutrition-related deficiencies, like vitamin A, iodine, and zinc, are widespread, especially in low-income countries. Protein-energy malnutrition (PEM) remains a significant public health concern, especially in low- and middle-income countries, where it is a leading cause of child mortality (UNICEF/WHO, Joint malnutrition estimates [3], 2020 FAO, 2019). In 2024, the global burden of PEM continues to be severe, with millions of children under five years suffering from stunting, wasting, or being underweight due to inadequate nutrition. According to the UNICEF/WHO Global Nutrition Report [5], malnutrition affects around 45% of all child deaths globally, with stunting and wasting remaining prevalent in regions such as South Asia and Sub-Saharan Africa. Despite some progress in reducing the prevalence of stunting (from 32.4% in 2000 to 21.3% in 2019), the overall number of malnourished children remains alarmingly high. India, in particular, has been identified as a country with critical malnutrition statistics, contributing to a large proportion of global undernutrition, with more than 35% of children under five years of age suffering from malnutrition in 2020 [3].

India has one of the highest rates of child malnutrition, with 35.7% of children under five underweight, 38.4% stunted, and 21% wasted. The prevalence is higher in rural areas. The Global Hunger Index (GHI) 2019 ranked India 102nd for child

malnutrition. Central and Northeastern India show the highest malnutrition levels, with significant disparities between the rich and the poor Global Hunger Index, 2019. Malnutrition contributes to 68.2% of under-five deaths in India, and factors like maternal anaemia exacerbate child malnutrition. States like Uttar Pradesh, Bihar, and Rajasthan have the highest malnutrition rates. Tamil Nadu has seen a marginal rise in child stunting, with 23% of children stunted and 19% underweight, according to NFHS-5 data (2019-20). Rural areas report higher rates of stunting (26.4%) compared to urban areas (20.1%). A tribal survey in Tamil Nadu reveals higher malnutrition rates among tribal children, with 43% underweight and 54% stunted. Preventive measures like nutrition education, immunization, and deworming are essential for combating malnutrition (Figure 1). To reduce malnutrition, India must focus on maternal health, breastfeeding, and adequate nutrition for children, in line with the SDG targets for 2030.

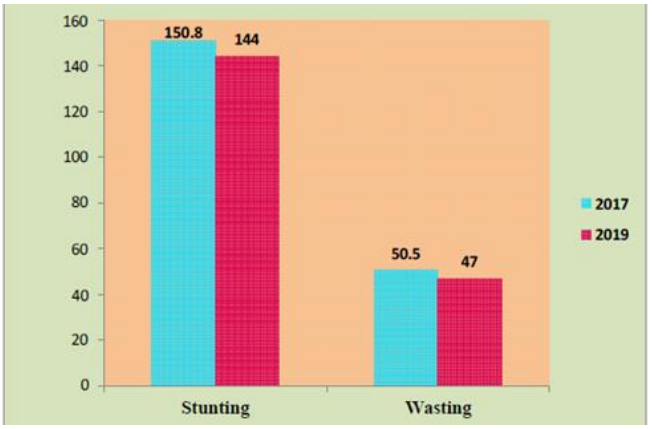

Figure 1: Prevalence of stunting & wasting among children with PEM [5]

1.2. Need of the Study

Protein-energy malnutrition (PEM) remains a critical public health issue despite ongoing efforts to combat malnutrition globally. As per the UNICEF/WHO 2024 joint malnutrition estimates [3], around 47 million children under five years of age are wasted, and 144 million children are stunted globally, with South Asia being the region with the highest prevalence. In India, approximately 35% of children under five suffer from malnutrition, with high rates of stunting (38.4%) and wasting (21%), according to the National Family Health Survey (NFHS-5) data from 2019-21.

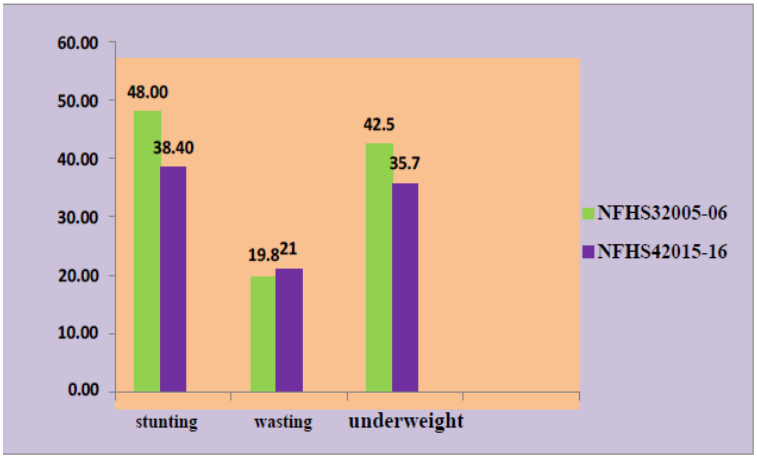

Figure 2: Malnutrition in under-five children-India [4]

The recent Global Nutrition Report [5] highlights that the prevalence of PEM is still high, especially in low- and middle-income countries, and that educating mothers about proper nutrition and feeding practices is essential in addressing these issues. Malnutrition, particularly during the first five years of life, has long-term effects on child growth, development, and survival. Inadequate nutrition can lead to stunted growth, delayed cognitive development, weakened immunity, and increased susceptibility to infections. In urban health centres like Podanur, where mothers have access to healthcare services, targeted educational interventions can significantly improve their knowledge about the causes, prevention, and management of PEM. A

learning package focusing on nutrition education and childcare practices can empower mothers with the tools they need to provide proper nutrition to their children, improving their health outcomes and reducing the burden of PEM.

Recent studies in India have indicated that lack of awareness and poor feeding practices are key contributors to malnutrition among children. Maternal education has a direct correlation with improved child nutrition and health, as educated mothers are more likely to adopt healthy feeding practices, exclusively breastfeed, and ensure a balanced diet for their children (Figure 2). As noted in the NFHS-5 (2019-20) data, there is a significant need for increasing awareness about child nutrition and improving maternal knowledge, especially in areas with high malnutrition rates [8].

The country's highest rates of malnutrition are seen in states like Assam, Bihar, Rajasthan, and Uttar Pradesh (UP). States such as Assam, Bihar, Rajasthan, and Uttar Pradesh have the highest disease burden rates among children due to malnutrition. In contrast, the lowest disease-burden states are Tamil Nadu and Kerala. As a result, the Lancet Child & Adolescent Health in each state must be considered when formulating appropriate policies. The year 2019. Every third child under the age of five suffers from chronic malnutrition, according to more than half of the states assessed (NFHS 5 2019-20). Except for Jammu & Kashmir, rural areas have a higher frequency of malnutrition than urban areas. Rural Meghalaya is witnessing a worsening of stunting. There has been a small rise of 3.5% in the incidence of malnutrition in Kerala during the past five years. NFHS 5 for the years 2019–2021. Statistics from the National Institute of Nutrition (NIN), Public Health Foundation of India (PHFI), and Indian Council of Medical Research (ICMR) show that 68.2% of all fatalities in children under the age of five were attributable to malnutrition in 2017. Malnutrition is the cause of death for 2:10 of India's children.

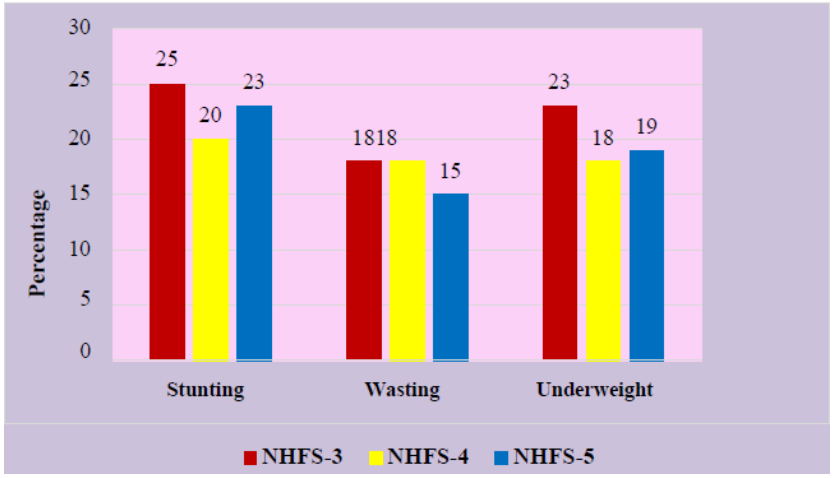

Figure 3: Trends in nutritional status of under five children-Tamil Nadu [4]

India still has a high rate of underweight, stunted, and wasting children. From 16% in Manipur to 42% in Jharkhand, 33% of India's children were underweight in 2017. As of 2017, 39% of children in India were stunted, with rates ranging from 21% in Goa to 49% in UP. The rates were highest in the economically disadvantaged states of Bihar, Chhattisgarh, Jharkhand, Odisha, Rajasthan, Madhya Pradesh, and Uttar Pradesh, while 15.7% of children were wasting away. This information is from the Lancet Child & Adolescent Health of 2019. In a comprehensive assessment that included the years 2000–2018, Dey and Bisai [9] found that 42.96% of tribal preschool-aged children in India were underweight, 44.82% were stunted, and 23.69% were wasting. Based on the 41 studies included in the review, the rates of underweight, stunting, and wasting can be attributed to various factors. These include socioeconomic status (10%), cultural norms around food consumption (10%), maternal education (15%), child feeding practices (20%), dietary deficit during pregnancy (25%) and poor nutrition of the child (52%).

The first phase of the National Family Health Survey (NFHS-5)2019-20 states that child stunting has increased in 13 states, including developed states like Tamil Nadu, Gujarat, and Maharashtra. Stunting decreased by 5% from 25% to 20% between NFHS-3 and NFHS-4, but NFHS 5(2019-20) shows a marginal rise. Data reveals that 26.4% of rural and 20.1% of urban under-five children are stunted (Figure 3). National Family Health Survey (NFHS-4) 2015-2016 stated that in Tamil Nadu, 16% are underweight, but NFHS 5 (2019-20) data evidences that 19% of under-five children are underweight,23% are stunted and 15% of under-five children are wasted.bNFHS-4 (2015-16) also reported that in Tamil Nadu, 48% of women aged (15- 49) had completed 12 or more years of schooling.26% of births in Tamil Nadu occur within three years of the previous birth. Only 3% of children under 6 months are exclusively breastfed, as WHO recommends. 82 % of children between 12-23 months received all basic vaccinations against six major childhood illnesses [3].

A tribal survey in Tamil Nadu shows a higher prevalence of underweight (26.9%%), with 9.2% severely undernourished and stunting (55.4%) and a lower prevalence of wasting (10.4%), with 1.9% being severely wasted. Male children were more affected by malnutrition compared to female children in this study. The UN agency has selected Tamil Nadu to implement the hunger-free state initiative as part of its ambitious sustainable development program [10]. There is a lack of health education and awareness among mothers of under-five children. Investigators during the clinical posting found that many mothers admitted their children to the hospital with protein-energy malnutrition, so investigators felt that if the mothers understood protein-energy malnutrition and its prevention, it might reduce the cadence rate, reducing complication and mortality rate among under-five children. Also, it may increase the knowledge and practice of mothers towards the prevention of protein energy malnutrition. Hence, the investigator felt the need to prepare a structured teaching program to educate the mother regarding protein energy malnutrition and its prevention, especially for children under five.

Therefore, this study is highly relevant as it seeks to assess the effectiveness of a learning package in improving maternal knowledge of PEM and how this can be translated into improved practices that reduce the incidence of malnutrition in under-five children in urban settings like Podanur. By focusing on a practical, evidence-based intervention, the study aims to provide insights into how such educational programs can contribute to reducing the burden of malnutrition in urban populations and guide future public health strategies.

1.3. Conceptual Framework

A conceptual framework is an arrangement of interconnected ideas and the prepositions used to describe their relationships. A study's conceptual framework provides the researcher with the abstract and logical structure necessary to connect the study's findings to existing nursing knowledge. It draws on preexisting theory to guide the process of interest concept identification and definition as well as relationship proposal.

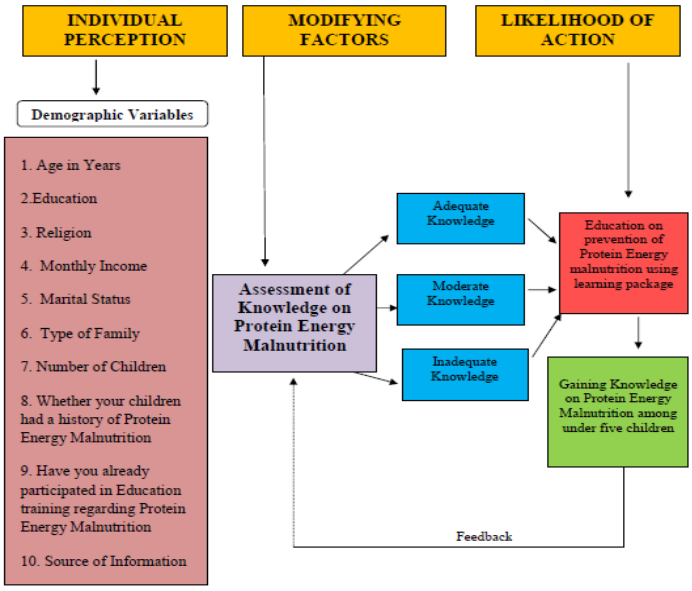

Figure 4: Modified conceptual framework on health belief model, Rosenstock and Becker

The model provides guidance for organizing the study's design, gathering data, and interpreting the results. A backer's health belief model serves as the foundation for this study. Perception at the individual level is the starting point of this paradigm. The participant is a woman whose child is less than five years old. Factors such as the mother's age, level of education, and monthly income impact individual perceptions. Family type, marital status, number of children, history of protein energy malnutrition in youngsters, and participation in a campaign to educate the public about this issue are all important questions to ask. Modifying variables make up the model's second part. Moms of children younger than five are evaluated based on their level of awareness about protein-energy deficiency, which is categorized as adequate, somewhat adequate, or inadequate. Mothers must take the initiative to educate themselves on how to prevent protein-energy deficiency. As per the model, the third component is the probability of taking action, which encompasses the likelihood of implementing suggested preventative health measures. Action is likely to be taken in this study if mothers are educated about protein energy malnutrition and how to avoid and care for their children with this condition using audiovisual aids. They will succeed in creating a healthy nation if they seek advice and education about protein energy malnutrition prevention at the right moment and put that knowledge into practice correctly (Figure 4).

2. Review of Literature

Manjunath et al. [11] did a community-based cross-sectional study in Kadukurub tribes of Mysore district for one year among 101 under-five children to assess the prevalence of malnutrition among under-five children and socio-demographic factors associated with it. Socio-demographic information and anthropometric measurements were obtained by using standard techniques. The height and weight of each child were compared with the World Health Organization (WHO) child growth standards, 2006 for that age and sex. The study findings showed that 60.4% were underweight, 55.4% were stunted, and 43% were wasting, which had a significant association concerning age, the presence of ration cards in the family, and including eggs in the child's diet.

According to Bharathi [13], who surveyed moms of children younger than five, she found that many of them knew very little about protein energy malnutrition and linked this knowledge with certain demographic factors. In order to find, choose, critically evaluate, and report on existing knowledge on the problem chosen for the study and to build the technique tool for data collection, the investigator conducted a thorough literature review for the project. Quantitative methods and a descriptive research methodology were utilized in this study. Thirty moms with children younger than five were chosen for the study using accessible selection approaches. In terms of mothers' knowledge of protein-energy malnutrition, the researcher used a standardized tool that included 10 demographic variables and 15 questions. Of the mothers surveyed, 23% had insufficient knowledge, 46.7% had moderate knowledge, and 30.0% had adequate knowledge. There was a statistically significant correlation (x2=318) between the mothers' educational attainment and their level of knowledge while controlling for demographic factors. Therefore, educators in the clinical domain can improve their understanding of protein energy malnutrition among mothers of children under the age of five by demonstrating compassion, competence, conscience, confidence, and commitment [7]. The cross-sectional descriptive analysis was carried out by Sahbanathul [12] using a random sample technique. We tested the origin of PEM in 1501 slum children, ranging in age from three to five, from two different zones. Approximate numbers made up the sample. Preschoolers in the 3.5–year age bracket living in slums throughout four zones in north Chennai had a protein energy malnutrition (PEM) prevalence of 50%, with a 5% level of significance and an absolute precision of 2.5% on both sides.

A third of the world's stunted children live in India, with 46.6 million being affected, according to the Global Nutrition Report [5]. Malnutrition is the leading cause of death for children in India, accounting for over half of all cases. Several factors interact intricately to cause childhood malnutrition, including but not limited to poverty, lack of education, mother's health, household dynamics, family size, eating habits, diarrhoea-like symptoms, cleanliness of hands and other surfaces, etc. Malnutrition affects moms of children younger than five; thus, raising awareness about the issue is crucial. In this study, a one-group pretest and post-test approach was utilized before the experiment. The samples were chosen using a method known as purposive sampling. Forty people made up the sample. The knowledge on the prevention of protein energy malnutrition was assessed using a standardized questionnaire. Results from the pretest indicated that 34% had insufficient knowledge, 10% had intermediate knowledge, and 5% had sufficient knowledge; 34 participants (85%) had insufficient knowledge. Twenty students (or 50%) demonstrated sufficient knowledge, and twenty more (or 50%) exhibited moderate understanding following the organized instruction program. Factors such as age, socioeconomic position, level of education, profession, number of children, breastfeeding, and immunization did not correlate significantly with post-test knowledge.

Researchers Joseph and Tata [14] found that 60 moms from chosen Anganwadis in Karad Taluk, Maharashtra, who had children less than five years old, had more information about how to regulate and avoid protein energy malnutrition as a result of the Health Education Program. The researchers employed a nonprobability purposive sampling strategy. We utilized a pre-and post-test design based on a one-group experimental design. To gather information, a knowledge questionnaire that was constructed was modified. Results showed that participants gained more information after participating in the health education program about protein energy malnutrition prevention and control compared to before the program. This prompted the researchers to conclude that the program was successful in its aims. An educational intervention to increase mothers' understanding of proper child feeding was the subject of a study by Sandhiya [15]. Using a straightforward sampling strategy, 60 women with children younger than five were chosen for the study. The researchers employed a pre-experimental one-group pretest and post-test design. A semi-structured questionnaire was used to evaluate the prior knowledge. Preventing malnutrition was the focus of the lesson that followed the pretest. The post-test was administered using the identical instrument seven days later. We used both descriptive and inferential statistics to look at the numbers. The results demonstrate that 20% of moms with children less than five possess sufficient knowledge. Sixty percent of moms with children younger than five have a moderate level of education. Twenty percent of moms whose children are less than five do not have enough education.

3. Materials and Methods

To evaluate the efficacy of the learning package on protein energy malnutrition among mothers of children at a chosen urban health center in Nanjundapuram, Coimbatore, this study adopted a quantitative methodology. The study methodology included

a per-experimental one-group pretest-posttest. At the Nanjundapuram Coimbatore Urban Health Centre, researchers surveyed moms with children younger than five. The 45,000 people who live within the Urban Health Center's service area receive all of the medical attention they need, including prenatal care, postnatal care, immunizations, and more. Mothers of children younger than five who visited an urban health center in Nanjundapuram, Coimbatore, were the focus of this study. Mothers whose children are patients at an urban health center in Nanjundapuram, Coimbatore, make up the sample population for this research. The study employed a nonprobability convenient sampling strategy. The research used a sample size of 30. Mothers who were able to focus on the teaching program, because their children were sick were not included in the study, but mothers who had at least one child under the age of five were present during data collection and knew Tamil and English were eligible to participate (Figure 5).

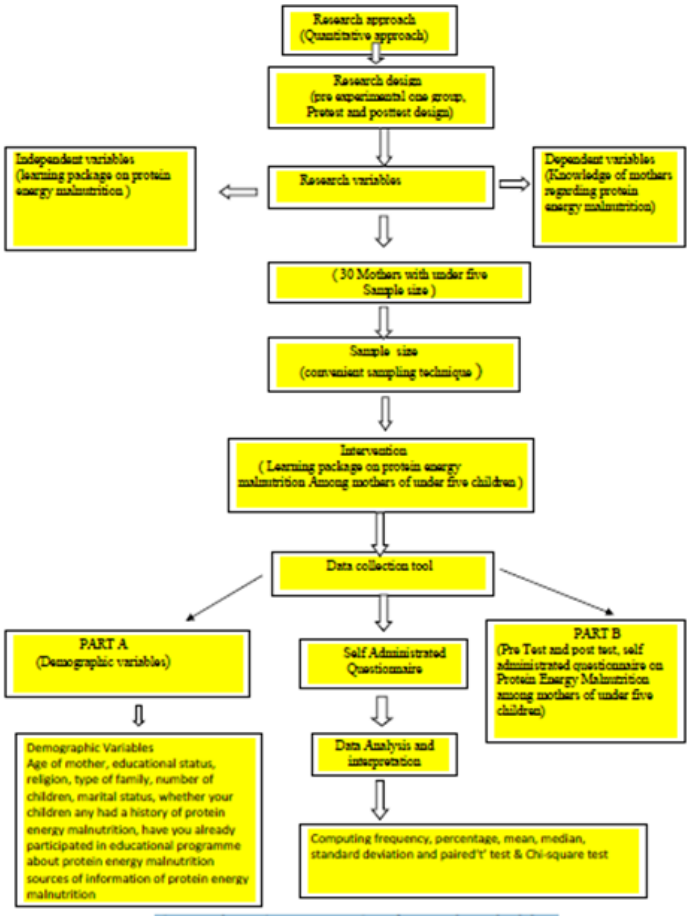

Figure 5: Schematic representation of research methodology

Mothers' ages, levels of education, religion, monthly income, marital status, number of children, and other demographic variables were collected through self-administered questionnaires. Mothers' knowledge about protein-energy malnutrition was evaluated through a 30-item knowledge questionnaire that consisted of 30 multiple-choice questions with 3 options and was scored from 0 to 30. Inadequate knowledge was the category into which the score fell (0–10). 11–20, Intermediate understanding. Finally, 21–30, Sufficient understanding. Four pediatric nursing specialists and one paediatrician were consulted to establish the tool's validity. After receiving feedback from specialists, the tool underwent revisions before being finished. The tool was determined to be reliable (0.8) after undergoing reliability testing using the test-retest approach. In order to examine the demographic characteristics, descriptive statistics, frequency, and percentage were used. Descriptive statistics, the Mean, and the standard deviation were used to examine the degree of knowledge. Inferential statistics were used to test the effectiveness package, and the results were computed. A chi-square test was used for inferential statistics to examine the relationship between demographic variables and the pretest score.

The urban health center officer gave their approval before the trial could begin. Using convenient selection approaches, we chose women whose children were less than five years old. Mothers whose children were less than five years old gave their informed consent once the researcher introduced herself to the sampling. A pretest employing a self-administered questionnaire

was also administered on the same day. A learning package on protein energy malnutrition was used for the one-hour pretest. In order to determine whether the 45-minute training session was successful in preventing protein energy malnutrition in women with children younger than five, a follow-up test was given seven days later using the same self-administered questionnaire. On Wednesdays, the designated day for kid vaccinations, ten women were chosen weekly. After obtaining formal authorization from the relevant authority and informed consent from the moms, the study was approved by the ethical committee of Texcity College of Nursing in September 2023. The data was kept confidential, and the subjects' identities were protected. Sincerity and objectivity were upheld to ensure the study's scientific objectivity.

4. Result

4.1. Description of Study Participants Based on Demographic Variables

Table 1 depicts the frequency and percentage distribution of study participants based on demographic variables. According to age in years, the majority of 16 (53.33%) of them were between 30-35 years of age, 6 (26.67%) of them were in the age group of > 30 years, and 6 (20%) of them aged between 36-40 years. Regarding educational qualifications, the majority of 9 (30%) were educated up to higher education level, 8 (26.67%) were graduates, 7 (23.33%) were illiterate, and 6 (20%) were educated to primary level. Concerning religion, the majority, 16 (53.33%), were Hindu, 8 (26.67%) were Muslim, and 6 (20%) were Christians.

Regarding monthly income, the majority of 17(56.67%) were earning Rs. 10,000-15,000, 9 (30%) were earning Rs. 5,000-10,000, 3 (10%) were earning>15,000 and 1(3.33%) were earning<5,000. Regarding the type of family, the majority, 16 (53.33%), were living in single families, 10 (33.33%) were living in joint families, and 4 (13.34%) were living in extended families. In allocation to the number of children, the majority, 21 (70%), had 2 children, 5 (16.67%) had more than 3 children, and 4 (13.33%) were having single children. Concerning previous exposure to educational training on PEM, the majority, 28 (93.33%), did not have it, whereas only 2 (6.67%) had exposure to previous education on protein energy malnutrition. Related to the source of information, the majority10 (33.33%) of them got information regarding PEM through healthcare workers, and 4 (13.34%) of them were through Television / Radio.

Table 1: Frequency and Percentage distribution of study participants based on demographic variables (N-30)

No.	Demographic Variables	Frequency (f)	Percentage (%)
1.	Age in Years		
	<30	8	26.67
	30-35	16	53.33
	36-40	6	20
2.	Education		
	Illiterate	7	23.33
	Primary Education	6	20
	Higher Education	9	30
	Degree	8	26.67
3.	Religion		
	Hindu	16	53.33
	Muslim	8	26.67
	Christian	6	20
4.	Monthly Income		
	Rs. <5,000	1	3.33
	Rs.5000-10,000	9	30
	Rs. 10,000–15,000	17	56.67
	Rs.>15,000above	3	10
6.	Type of Family		
	Joint	10	33.33
	Single	16	53.33
	Extended	4	13.33
7.	Number of Children		
	One	4	13.33
	Two	21	70
	Three and above	5	16.67
8.	Educational Training		

	Program on PEM		
	Yes	2	6.67
	No	28	93.33
9.	Source of Information		
	Health Worker	10	33.33
	Television/Radio	4	13.34
	News Paper	6	20
	More than one Source	10	33.33

4.2. Pre and Post-Test Scores on Knowledge Regarding PEM Among Mothers of Under-Five Children

Table 2: Frequency and percentage distribution of pretest and post-test knowledge regarding PEM among mothers of under-five children (N-30)

Level of Knowledge	Pretest		Post-test	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Inadequate	28	93.33	0	0
Moderately Adequate	2	6.67	11	36.67
Adequate	0	0	19	63.33

Table 2 illustrates the frequency and percentage distribution of pretest and post-test levels of knowledge regarding protein energy malnutrition among mothers under five children. The study results revealed that, during the pretest majority, 28 (93.33%) had an inadequate level of knowledge, and 2 (6.67%) had a moderately adequate level of knowledge, whereas during the post-test majority, 19 (63.33) had an adequate level of knowledge and 11 (36.67%) had moderately adequate level of knowledge. It can be attributed to the effectiveness of the learning package regarding Protein Energy Malnutrition knowledge among mothers of children under five. The same has been depicted in Figure 6.

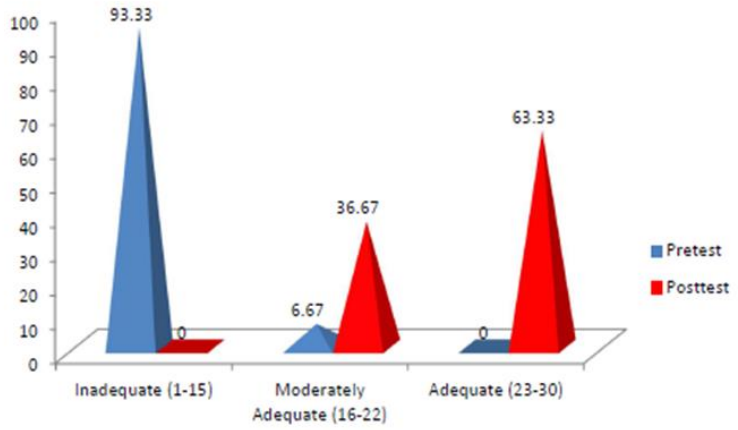

Figure 6: Percentage distributions of pretest and post-test scores on knowledge regarding PEM among mothers of under-five children

4.3. Effectiveness of Learning Package on PEM on Knowledge Regarding PEM among Mothers of Under Five Children

Table 3: Mean and standard deviation (SD) of Pretest and Post-test scores of Knowledge regarding PEM among Mothers of children under five (N-30)

Level of knowledge	Mean	SD	Mean Difference	Paired 't' value & p-value
Pretest	10.56	2.51	12.7	t=22.67
Posttest	23.26	2.27		(p<0.05)

Table 3 shows the Mean and SD of pretest and post-test scores of bits of knowledge regarding PEM. In the pretest, it was 10.56±2.51, and in the post-test score, it was 23.26±2.27. The Mean difference was 12.7. It was inferred that the learning

package was significantly (t-22.67, p<0.005) effective in improving the knowledge regarding PEM among mothers of under-five children.

4.4. Association between Pretest scores of bits of knowledge regarding PEM with selected demographic variables of mothers of under-five children

Table 4: Association between pretest scores of bits of knowledge regarding PEM with selected demographic variables of mothers of under-five children (N-30)

No.	Demographic Variables	Knowledge				Chi-Square	Table Value
		Inadequate		Moderately Adequate			
		(f)	(%)	(f)	(%)		
1	Age in Years						
	< 30	8	26.67	0	0	1.51#	5.9
	30-35	15	50	1	3.33		
	36-40	5	16.67	1	3.33		
2	Education						
	Illiterate	6	20	1	3.33	2.16#	7.815
	Primary Education	6	20	0	0		
	Higher Education	9	30	0	0		
	Degree	7	23.33	1	3.33		
3	Religion						
	Hindu	15	50	1	3.33	0.85#	7.815
	Muslim	7	23.33	1	3.33		
	Christian	6	20	0	0		
4	Monthly Income						
	Rs. <5000	1	3.33	0	0	4.95#	7.815
	Rs.5000-10000	7	23.33	6.67	6.67		
	Rs.10000-15000	17	56.67				
	Rs.>15000	3	10				
5	Types of Family						
	Joint	9	30	1	3.33	0.41#	5.9
	Single	15	50	1	3.33		
	Extended	4	13.33	0	0		
6.	Number of Children						
	1	4	13.33	0	0	1.16#	5.9
	2	19	63.33	2	6.67		
	3 and above	5	16.67	0	0		
7.	Educational Training Program on PEM						
	Yes	2	6.67	0	0	0.08#	3.841
	No	26	86.67	2	6.67		
8.	Sources of Information						
	Health Worker	9	30	1	3.33	1.0#	7.815
	Television/Radio	4	13.33	0	0		
	Newspaper	6	20	0	0		
	More than one source	9	30	1	3.33		

 # Not Significant

Table 4 reveals the Association between Pretest scores of bits of knowledge regarding PEM with selected demographic variables of mothers of children under five. The findings show that there was no significant association between the pretest knowledge score and selected demographic variables among Mothers of Under-five children.

5. Discussion

This study's findings reveal that the majority, 53.33% of them, were between 30-35 years of age. Bharathi [13] reported that 60% of the mothers were aged 15-25 years old, and 40% were between 26-35 years of age. Joseph and Tata [14] stated that

43.33% of mothers belong to 26 to 30 years of age. Welgandhwar [16] reported that 43.33% of the mothers from the age group 26 - 30 years. Only one-third of the mothers were educated up to a higher education level. Bharathi [13] reported that the majority 66.70% higher education. Joseph and Tata [14] reported that 48.33% completed high school education. Welgandhwar [16] reported that 36.67% of the mothers were educated up to primary. In this study, most of them, 53.33%, belonged to Hindu religion. Similarly, a study by Bharathi [13] stated that the majority 80% of the mothers belong to the Hindu religion. Joseph and Tata [14] reported that the majority 80% of mothers were Hindus. A study by Welgandhwar [16] reported that 33.33% of the mothers were from the Muslim religion, and 28.33% were from the Hindu religion. In this study, the majority of 56.67% earn Rs. 10,000-15,000 per month. Bharathi [13] stated that all of the participants were of moderate socioeconomic status. Joseph and Tata [14] reported that 70% of the mother's monthly family income was Rs.5001 and above. Welgandhwar [16] reported that 51.67% of the mothers had an income of Less than 5000 Rs.

Regarding the type of family, 53.33% of them were living in single families. Bharathi's [13] study reveals that the majority, 80%, were living in nuclear families. Joseph and Tata [14] reported that the majority, 78.33%, belong to the nuclear family. Welgandhwar [16] reported that 45% of the mothers are from nuclear families. Regarding the number of children, 70% of them had 2 children. Bharathi [13] reported 46.7% of the mothers having 2-3 children. Joseph and Tata [14] reported that 48.66% of them had one child. Welgandhwar [16] reported that 55% of the mothers had one child,

In this study, the pretest scores showed that the majority, 90%, had moderate knowledge and 10% had adequate knowledge. In the post-test results, 13.3% had moderate, and 86.7% had adequate knowledge. This shows that the learning package on PEM increased the knowledge among the mothers regarding PEM. Bharathi [13] reported that 23.3% had inadequate knowledge, 46.7% had moderately adequate knowledge, and 30% had adequate knowledge. Reported that in the pretest majority, 85% had inadequate knowledge, 10% had moderate knowledge, and 5% had adequate knowledge about PEM. After the structured teaching program on PEM, in the post-test, 50% had adequate knowledge, and 50% had moderate knowledge. Joseph and Tata [14] reported that in the pretest majority, 41.66% of mothers had poor knowledge, 3.33% had average knowledge, and 25% had good knowledge, whereas in the post-test, 55% had good knowledge, 30% had average knowledge, and 15% had poor knowledge. Welgandhwar [16] reported that in the pretest, 13.33% of mothers had poor knowledge, and 86.67% had average knowledge regarding the prevention and management of PEM. Whereas in the post-test, 70% of mothers had average knowledge, and 13% had good knowledge.

In addition, the Mean of the pretest score was 10.56±2.51, and the post-test score was 23.26±2.27, with a mean difference of 12.7. The paired 't' value was 22.67, which was significant at the $p<0.05$ level, indicating the learning package was effective in improving the knowledge among the mothers of under-five children. Joseph and Tata [14] reported that the mean post score (21.766± 5.08) was higher than the mean pretest score (9.183± 3.35). Welgandhwar [16] reported that in the pretest, the average score was 10.70, with a standard deviation of 1.87. The post-test average score was 15.76, with a standard deviation of 1.67. The paired t-test was 16.26 with a value of 0.01. Shows that community-based education programs on knowledge regarding the prevention and management of PEM among the mothers of children under five in selected rural areas were effective. The study findings also revealed that there is no significant association between the pretest knowledge score and the selected demographic variable among mothers of children under five. Bharathi [13] reported only mothers' education and type of family had a significant association with knowledge score. Reported no association with the demographic variables. Joseph and Tata [14] reported that there was a significant association found between the knowledge of mothers of under-five children and diet, occupation, type of family, and immunization status of the child.

6. Conclusion

The findings of this study indicate that the structured learning package on Protein Energy Malnutrition (PEM) was highly effective in enhancing the knowledge of mothers of under-five children. The significant improvement in knowledge levels from pretest to post-test—evidenced by the increase in adequate knowledge from 10% to 86.7% and a mean score rise from 10.56±2.51 to 23.26±2.27—demonstrates the success of the intervention. The statistically significant paired t-value (22.67, $p < 0.05$) confirms that the difference was not due to chance. Furthermore, the absence of any significant association between pretest knowledge scores and selected demographic variables suggests that the learning package was universally beneficial across different backgrounds. Therefore, such educational interventions can be considered a valuable strategy to empower mothers with the knowledge necessary to prevent and manage PEM in young children.

Acknowledgment: Support and guidance from my supervisors, Prof. D. Charmini Jeba Priya and P.Thenmozhi.

Data Availability Statement: The study collected data from the mothers of under-five children were selected who were attending the Urban Health Centre, Podanur, and Coimbatore, Tamil Nadu, India. And the literature data was collected from

google scholar, PubMed, and ScienceDirect to interpret the result. This is the new study conducted by the authors. The corresponding authors were notified to provide data for this work.

Funding Statement: No funding was received to conduct the research.

Conflicts of Interest Statement: Authors collectively produce this work where they all agree with the work done, issues faced during the project and findings. The authors declared no conflict of interest. Citations and references are mentioned as per the information used.

Ethics and Consent Statement: This work is a draft from the corresponding author. Permission for data collection was obtained from the Institution, and Informed consent was obtained from the study participants. Authors of the work unanimously consent to making this publication available to all interested people for reading, teaching, and learning.

References

1. J. M. Black, J. H. Hawks, and A. M. Keene, Medical-Surgical Nursing: Clinical Management for Positive Outcomes, New York, United States of America: W.B. Saunders, 2019.
2. M. J. Hockenberry and D. Wilson, Wong's Essentials of Pediatric Nursing. Elsevier, Amsterdam, Netherlands, 2009.
3. Joint malnutrition estimates. United Nations Children's Fund & World Health Organization, USA, 2024.
4. I. Mumbai, Ed., "International Institute for Population Sciences (IIPS) and ICF," in National Family Health Survey (NFHS-4), 2015, pp. 2015–2017, USA.
5. "Global nutrition report: The state of global nutrition," Global Nutrition Report, WHO, USA, 2024.
6. A. Ranjitha, N. Angadi, and D. Mahabalaraju, "Study to Assess the Maternal Factors Influencing Undernutrition among 3- to 6-Year-Old Children of Davangere City," Natl J Community Med, vol. 7, no. 11, pp. 890–893, 2016.
7. India State-Level Disease Burden Initiative Malnutrition Collaborators, "The burden of child and maternal malnutrition and trends in its indicators in the states of India: The Global Burden of Disease Study 1990-2017," Lancet Child Adolesc. Health, vol. 3, no. 12, pp. 855–870, 2019.
8. "International Institute for Population Sciences (IIPS) and ICF. National Family Health Survey (NFHS-5)," pp. 2019–2021, USA, 2021.
9. U. Dey and S. Bisai, "The prevalence of under-nutrition among the tribal children in India: a systematic review," Anthropological Review, vol. 82, no. 2, pp. 203–217, 2019.
10. S. Sivakumar and M. Jayalakshmi, "Assessment of nutritional status of children aged under five years in tribal population of Jawadhu hills in Tamil Nadu," International Journal of Community Medicine and Public Health, vol. 4, no. 10, pp. 3907–3911, 2017.
11. R. Manjunath, J. K. K, P. Kulkarni, K. Begum, and G. M. R, "Malnutrition among under-five children of kadukuruba tribe: need to reach the unreached," J. Clin. Diagn. Res., vol. 8, no. 7, pp. JC01-JC04, 2014.
12. M. J. Sahbanathul, "Prevalence of Protein Energy Malnutrition Among Children at Slums of North Chennai," International Journal of Scientific Research, vol. 2, no. 10, pp. 1–2, 2013.
13. A. R. Bharathi, "A study to assess the level of knowledge regarding protein energy malnutrition among mothers of under five children at selected area of Guduvancherry," Journal of Advanced Practices in Nursing, vol. 6, no. 9, pp.1-7, 2021.
14. T. Joseph and S. H. Tata, "A study to assess the effectiveness of health education program on knowledge regarding control and prevention of protein energy malnutrition among mothers of under five children from selected Anganwadies, Karad Taluka," International Journal of Science and Research (IJSR), vol. 3, no. 7, pp. 2208–2212, 2014.
15. P. S. Sandhiya, "A Study to Assess the Knowledge on Protein Energy Malnutrition among Mothers of Under Five Children in Selected Areas at Kanchipuram District, Tamil Nadu," Tamil Nadu. Medico-Legal Update, vol. 21, no. 1, pp. 1–6, 2021.
16. P. V. Welgandhwar, "A Pre-Experimental Study to Assess the Effectiveness of Community based Education Program on Knowledge Regarding Prevention and Management of Protein Energy Malnutrition among the mothers of Under Five Children in Selected Rural Areas," International Journal of Science and Research, vol. 13, no. 4, pp. 1625–1633, 2024.