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A cross-sectional study on dietary pattern and nutritional status of rural lactating mothers of Kandhamal district of Odisha, India

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Abstract

In a woman's life, the nutritional requirement is maximum during lactation than in other periods of life because an infant gets its nutrition from its mother's milk. Therefore, in addition to her body requirements, the mother must provide dietary supplements for her infant. The present study conducted on 100 lactating mothers of 0-6 lactating months, who were selected randomly from rural areas of Kandhamal district of Odisha aims to assess the dietary pattern of the lactation mothers and their nutritional status. Data was collected by a self-structured questionnaire consisting of general demographic information, anthropometric assessment, dietary and nutritional information of the mother. The daily nutritional intake of specific nutrients like energy, protein, fat, β carotene, calcium, and iron of each lactating mother was calculated using the food composition table given by NIN. The food consumption of the mothers was very low and this leads to weight loss and under nutrition in 55% of lactating mothers. When the mean nutrient intake of the aforementioned nutrients was compared with the RDA, 2010 (NIN) it showed a marginal difference. The multiple logistic regression analysis showed the common factors that significantly affect the nutritional status of the rural lactating mothers were family income, low socioeconomic status of food and less availability of food, and lack of knowledge related to the essence of balanced and nutritious food during lactation.

Keywords: Lactation, nutritional status, FFQ, 24- hour recall method, balanced food

Introduction

The functioning of the minds of the future is necessary for the growth and development of the future world. And proper nutrition is essential for a child's development from conception onward in order to make their minds more productive and effective. Mothers play an immeasurable role in making this effective. A mother directly affects the growth and development of the fetus during pregnancy and lactation. Compared to pregnancy and other phases of a woman's life, the physiological and nutritional demands of lactation are significantly greater. The process of lactation, also known as nursing or breastfeeding, occurs when a mother secretes milk from her mammary gland to nourish her young. Optimal nutrition for the newborn will be provided by exclusive breastfeeding during the first six months of life and continuing it for the next two years, according to the WHO. Mammogenesis, lactogenesis, galactopoiesis, and involution are the four steps that the lactation process goes through. The prolactin reflex and let down reflex are two different steps that are involved in the prolactin and oxytocin-mediated mechanism of milk production. Oxytocin aids in squeezing out the milk through the letdown reflex, and the prolactin hormone increases milk production via the prolactin reflex. Significant amounts of "mature milk," or less viscous, white milk that is secreted by the mother and is thought to provide a nutritionally complete diet for the baby. The mother's food, nutritional health, as well as her emotional and psychological state, all affect how much milk she secretes.

The mother and child continue to have a nutritional connection even after the pregnancy. Mother's milk provides the newborn with nutrients. Therefore, in order to meet the baby's growing nutritional needs, the mother must also take care of her own body's needs. The quality and volume of milk secreted were affected by the nursing mother's suboptimal nutrition and insufficient nutritional intake. When a woman is well-fed, she secretes roughly 850ml of milk each day, as a comparison to 400ml when she is undernourished. As a result, the mother's nutritional requirements increased during breastfeeding in order to produce enough breast milk, meet her own daily requirements, give the growing baby enough nutrients through milk, and provide the energy needed for milk production.

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The lactating mother's additional energy requirements are brought on by the yield of milk, which is determined by the amount of milk secreted, its energy content, and the effectiveness of the conversion of dietary energy to milk energy. The mother and the baby both need proteins to grow and improve health.

During the first three to six months of lactation, the mother's bone mineral density (BMD) temporarily decreases due to the baby's increased calcium needs mobilizing calcium from her skeleton. The mother's requirement for iron as well as the requirement to make up for iron lost in breast milk make up the total iron requirement during lactation. Therefore, it is crucial to have the right amount of micronutrients, such as vitamins and minerals, in addition to the macronutrients. The current study set out to evaluate the nutritional status and dietary pattern of 0-6 Months lactation mothers.

Materials and Methods

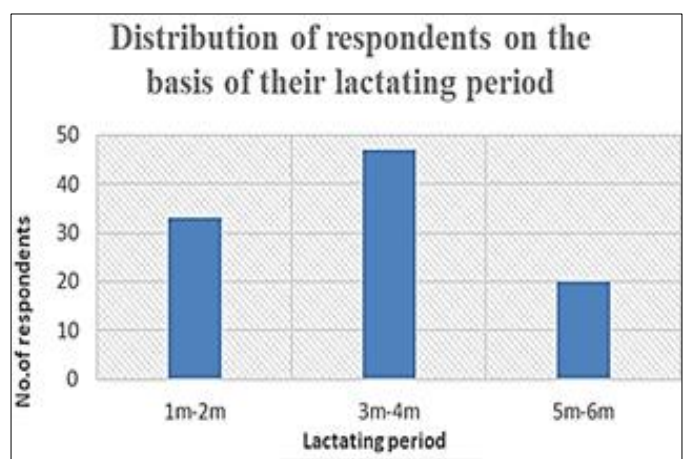
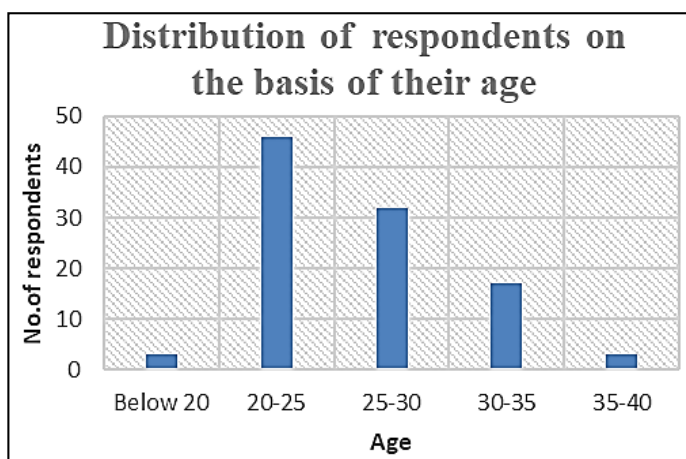
In rural Tikabali Tehsil, Kandhamal district of Odisha, the current study was conducted on 100 lactating mothers. 7 villages were included in the research area. The mothers' lactation period of 0 to 6 months was the only requirement for subject inclusion, and they were selected using simple random sampling. Mothers with breastfeeding periods of 6 to 12 months and those with any other disease problems were excluded from the study since the newborn began weaning during this time and mother's milk is utilized in conjunction with other meals for the infant's nourishment. A self-structured questionnaire plus an interviewing technique was used to get the data. The demographics of the research area were examined beforehand, the study's purpose was made clear to respondents before the event, the questionnaire's questions were written in the respondents' native tongue, and they were given the proper information in order to prevent response bias. The questionnaire is divided primarily into four sections: general information, specific information, anthropometric assessment, and mother's dietary and nutritional data. While the General Information section asks about things like age, education, occupation, family size, socioeconomic status, and the nature of an activity, the

Specific Information section asks specific questions about the health of rural lactating mothers and also gathers data on things like water usage, eating habits, and knowledge and practices related to a particular diet.

The respondent's height and weight are used to calculate their anthropometric measurements. According to weighing machine instructions, the mother's weight was recorded. The vertical measuring rod or a wall-mounted scale is used to measure the moms' heights. The questions in the section on diet and nutrition are based on the mother's eating habits, daily nutrient intake, food intake frequency (by FFQ), and likes and dislikes. Dietary recall method was used to record the last 24 hours' worth of food ingested. All of the individuals' Body Mass Indexes (BMIs) were calculated using the recommended formula, and on the basis of those results, their weight status (underweight, normal, or overweight) was determined. Utilizing the food composition table provided by NIN (National Institute of Nutrition), the daily nutritional intake for each lactating woman was estimated. It was computed how much of certain nutrients, such as energy, protein, calcium, and iron, were consumed daily. The values are then compared to the RDA 2010 recommendations provided by the Indian Council of Medical Research (ICMR).

Result and Discussion

A nursing woman is more likely to be at nutritional risk if she is under 17 years old, living in poverty, has a restricted diet, or engages in unhealthy eating habits. A breastfeeding mother's diet must include more calories and other essential nutrients to maintain the production of an acceptable amount of breast milk with excellent quality. The majority of mothers should have adequate nutritional reserves for nursing, and the mother's diet can have an impact on the nutritional composition of breast milk, including the quantity produced, the protein content, the water-soluble vitamin content, and the fatty acid composition. From this study, it was found that 46% of the mothers belong to 20-25 age group whereas some of them also belong to less than 20 and more than 35yrs which itself is very risky for them.



Because the mothers consumed so little, 55 percent of breastfeeding mothers lost weight and had inadequate nutrition. In order to maintain a healthy existence, Paoli *et al.* (2019) [12] stated that there should be 5–6 meals per day. However, this study discovered that only 2% of moms eat 5

meals per day, and the majority of mothers take fewer than 5 meals, which results in a lower fulfillment of their nutritional demands. In their study, Kiday *et al.*, (2013) discovered the same instances.

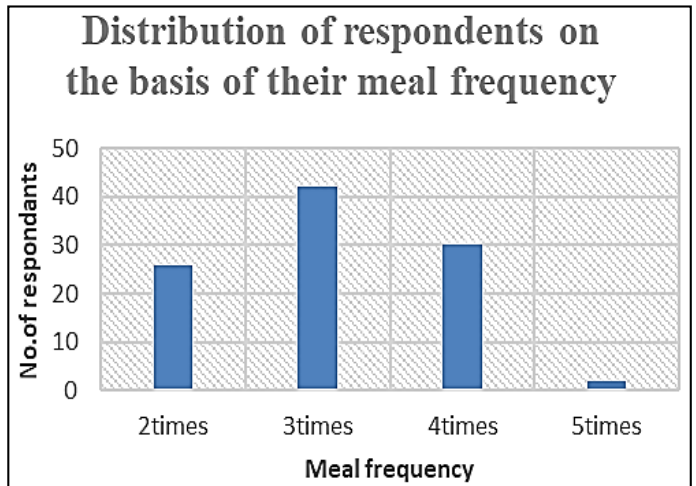
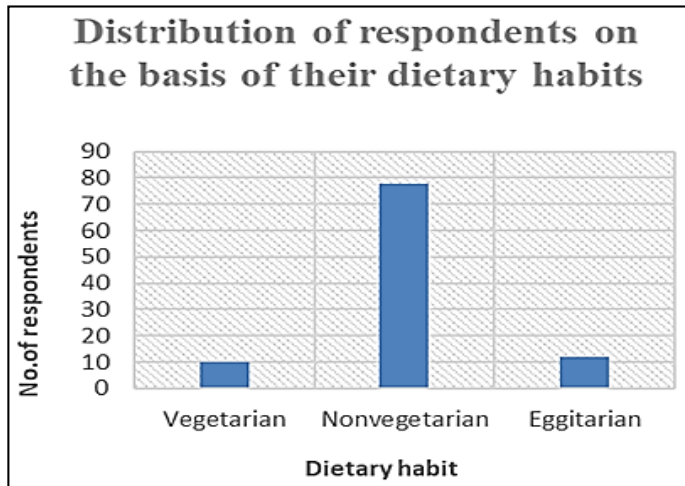


Table 1: Distribution of the respondents based on food frequency pattern

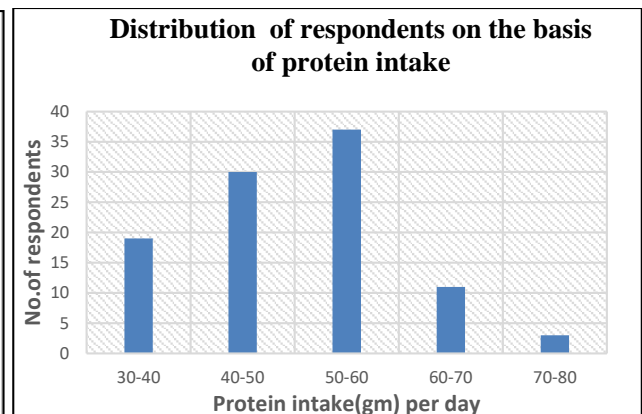
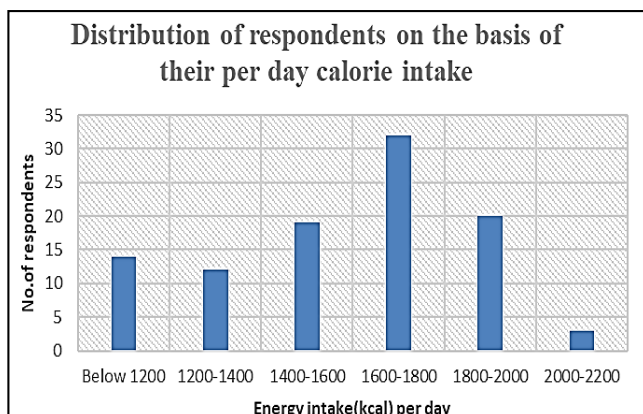
Food Groups	Intake Frequency			
	Daily	Weekly	Rare	Never
Cereals				
Rice	100	-	-	-
Wheat	-	65	35	-
Ragi	-	10	75	15
Pulses and legumes	40	50	10	-
Fats and oil	100	-	-	-
Green Leafy vegetables	76	24	-	-
Other vegetables	89	11	-	-
Roots and tubers	100	-	-	-
Fruits	-	6	89	5
Flesh foods	-	12	78	10
Egg	-	85	5	10
Nuts and seeds	-	-	4	96
Sugar and jaggery				
Sugar	100	-	-	-
Jaggery	-	9	-	91
Milk and milk products	-	3	85	12

Table 1 shows the distribution of subjects on the basis of their food frequency pattern. It depicts that the rural lactating mothers take cereals in which rice is the staple, fats and oils, roots and tuber and sugar on daily basis however only 40% of them were taking pulses and legumes daily and rest of the respondents either taking it weekly or rarely. Fruits, nuts and oilseed which should be taken on daily basis were not there in the diet of the respondents. Most of the respondents i.e., 89% were taking fruits which is a rich source of different vitamins

and minerals, rarely.

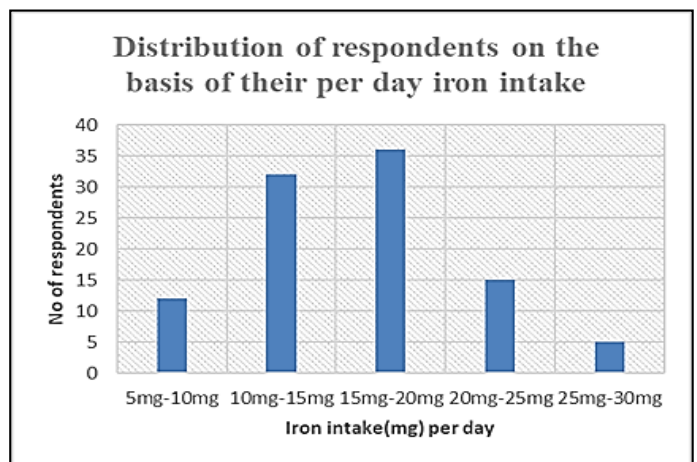
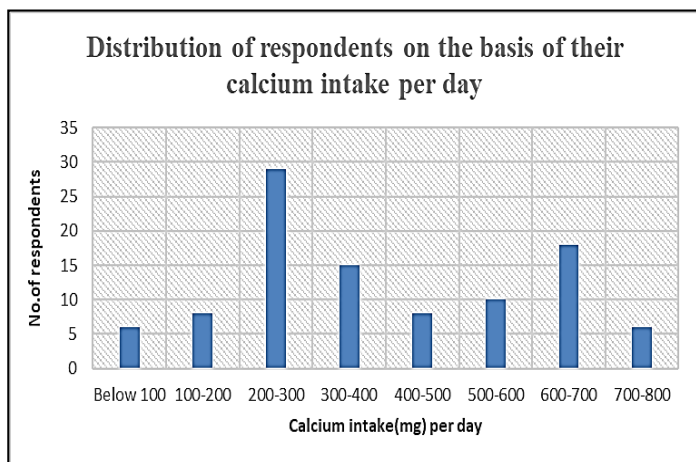
Additionally, they showed that nursing women were consuming fewer calories and other nutrients than what FAO/WHO/UNU suggested, and the results of the current study confirmed these findings. When the per day intake of vital nutrients like calories, protein, calcium, and iron were compared with the RDA suggested by ICMR-NIN it showed a marginal difference. An additional 600kcal of energy per day is needed during lactation to meet the energy need of the body. For the source of calorie intake, the sole food eaten by the mothers was rice but still, there was a low per day calorie intake because the frequency, quality and quantity of a meal were low i.e. on an average only 1582±275.81 kcal of the calorie was taken by the rural mothers.

According to Fikawati *et al.*, (2017) [5] inadequate nutritional knowledge, a negative attitude toward the high energy demands of nursing, a lack of time, reduced milk and supplement use, and dietary restrictions are the main causes of low dietary energy consumption among breastfeeding mothers. The mother and the young one both need proteins to grow and stay healthy. The recommendation for protein intake for a 0-6month lactating mother is an additional 22.9gm and a total 77.9 gm protein per day is required. But from the study, it was found that the average per day intake of protein is 49.9±15.56gm, which was less than the recommended amount of protein. In impoverished nations, plant sources provide the majority of the protein needed by breastfeeding women who live in difficult circumstances (Prentice *et al.* 1983) [13]. The protein they obtain from plant sources that comparison to the protein they can obtain from animal sources is thus dubious.



The daily intake of fats was also low among the respondents. The mean fat intake was 12 ± 7.71 gm per day. Though the respondents were taking fats and oils daily (Table 1) but the quantity was low which does not meet their daily body requirements. The different nuts and oilseeds which are major sources of good quality fat essential for the cognitive development of infants were absent in the diet. A lactating mother should consume 200 mg/d DHA (Docosahexaenoic Acid) for optimal health and infant development in areas like Eye-hand coordination, motor skills, and attention span. Most of the respondents have never eaten these healthy foods. This may be partly due to the high purchasing cost of these foods. Vitamin A has many roles in our body such as it helps in normal vision, gene expression, growth, and immunity. As the newborn infant depends on the mother for its total nutrition, the mother's milk needs to be a good source of vitamin A. Various studies showed that the infant fed with vitamin A deficient breast milk are susceptible to diseases like xerophthalmia, infections, and growth retardations. When the mother is fed with a sufficient quantity of vitamin A rich foods like green leafy vegetables, the vitamin A content of the breast milk also increases. In this study, it was observed that the Vitamin A intake of rural lactating mothers was 1520 ± 1193.25 µg per day. Similarly, calcium is required for the development of bone of infant and though the infant gets its nourishment through mother's milk so mother's diet need to be rich in calcium rich

foods. Zhang ZQ *et al.* (2016) [20] on their study showed the effects of different levels of calcium supplementation on the bone mineral status of postpartum lactating women. The BMD (Bone Mass Density) of the mother, more specifically at trabecular-rich sites like the spine and hip (Laskey *et al.* 1998) [10] decreases during pregnancy and lactation. Increasing dietary Ca intake may prevent the excessive mobilization of bone minerals in nursing mothers. The RDA of calcium increased to 1200mg from 600mg during lactation. But in case of the studied lactating mothers, the foods rich in calcium like milk and milk products, optimum quantity of green leafy vegetable, coarse grains or millets were very low and that leads to lesser calcium intake than the RDA. The average intake of calcium among the mothers was 393 ± 200.62 mg. Iron intake increased in case of lactating mothers to compensate the loss of iron from body during delivery and if that need does not fulfilled then it will lead to anemia this was also studied by Zhao *et al.*, (2014) [21]. The ICMR recommended 25mg of iron per day. In this study, the iron intake by the lactating mothers were very low i.e. the average iron intake was 15.95 ± 5.13 mg and so there is a possibility of anemia in the rural lactating mothers. Though the mothers were taking green leafy vegetables which is a rich source of haem iron but the quantity was not enough and there is not much sources of non-haem iron which has better bioavailability.



From the food frequency the intake of individual food group has been derived and it is shown that the variability in their diet is very low. The staple food of the rural lactating mother was Rice. The intake of other cereal like wheat, maize and millets like ragi, bajra which are rich and cheapest sources of many macro and micro nutrients are lacking in the diet of the lactating mothers regardless of their availability in those rural areas. This may be due to the unawareness of their nutritional benefits and different processing methods. Similarly in case of the intake of pulses and legumes, there was no variation. 76% respondents eat green leafy vegetables daily and 24% were taking twice or thrice in a week (Table 1). The low intake of green leafy vegetables is responsible for their low intake of per day iron which is less than the recommended amount of intake. The different nuts and oilseeds which are major source of good quality fat essential for the cognitive

development of the infants were absent in the diet. A lactating mother should consume 200 mg/d DHA (Docosahexaenoic Acid) for the optimal health and infant development in areas like Eye-hand coordination, motor skills and attention span. Most of the respondents have never eat these healthy foods. This may be partly due to the high purchasing cost of these foods. Most of the respondents that is 89% are taking fruits rarely. The consumption of milk and milk products are negligible among the respondents and this is partly related to the per day low intake of calcium than the recommended level. Water is an important element for milk secretion so the lactating mother should take adequate water. From this study, it was found that the majority of the respondents i.e. 57% were taking 3-4 glasses of water and the other 43% of respondents were taking 6-8 glasses of water in a day.

Table 2: Distribution of respondents based on the mean nutrient intake

Nutrient	RDA	Mean nutrient intake	Percentage of RDA met	% deficit/excess
Energy kcal	2500	1582	63.28	-36.72
Protein g	77.9	49.9	64.05	-35.9
Fat g	30	12	40	-60
β carotene μ g	7600	1520	20	-80
Calcium mg	1200	393	32.75	-67.25
Iron mg	25	15.95	63.8	-36.2

Table 2 depicts the mean nutrient intake of the respondents in comparison to the RDA for Indian lactating mothers with sedentary activity. It was observed that the mean calorie intake of the lactating mothers was 36.7% less than the recommended allowances whereas 63.28% met the requirement. Similarly, the mean protein intake of the respondents was 35.9% less than the recommended allowances of protein i.e., 77.9 gm and 64.05% met the daily requirement. The mean nutrient intake of calcium and iron were 393 mg and 15.95 mg respectively. The mean nutrient intake of these minerals was also 67.25 and 36.2 percent less than the RDA respectively. The mean nutrient intake in the case of fat is lower than the RDA i.e., 30 gms. Only 40% of the RDA met. The mean nutrient intake of vitamin A as β carotene was 1520 μ g. Here the daily intake is 80% deficit from the RDA for β carotene i.e., 7600 μ g.

The study of Kirksey *et al.* (2015) [24] also revealed that low-income lactating mothers have the highest rates of underweight. The multiple logistic regression analysis showed the common factors that significantly affect the nutritional status of rural lactating mothers were family income, low socioeconomic status of food, and less availability of food. Literacy levels also play a crucial role in determining the consumption of food. There is a positive and significant ($p=0.7$) relation between the health status and the literacy level of lactating mothers. Most rural mothers have low knowledge related to their nutritional needs and the necessity of balanced nutrition. Other factors like the inclusion of a variety of nutrient-rich food like nuts and oilseeds, low awareness related to the benefits of locally available food grains, low intake of water and fruits, and a variety of other vegetables have a potential role in determining the health status of the mother.

Conclusion

In a woman's life, breastfeeding is the time when her nutritional needs are at their peak. The goal of the current study was to examine the lactating mother's food habits and nutritional condition. The mother's nutritional status is greatly influenced by a variety of variables, including her psychological state, education, social level, and eating habits. Underweight can result from both postpartum weight loss and likely insufficient intake of a variety of foods. The majority of respondents have poor levels of education, which may have an impact on their understanding of nutrition, self-care, and the significance of good nutrition. The mothers' poor socioeconomic level also has an impact on the availability of food in their homes since they are unable to buy the basic items that are essential for good nutrition. It was discovered that the daily consumption of calories, protein, calcium, and iron was lower than the RDA for 2010 and that this deficient nutritional intake contributes to the malnutrition of breastfeeding women. Therefore, in a nutshell, low socioeconomic position, a lack of food availability in that area, a lack of information about their nutritional needs and requirements, and low food intake all contribute to the

mothers' poor nutritional status. Therefore, mothers in rural areas need to be well informed about their nutritional needs, balanced food intake, dietary modifications during lactation, locally available nutrient-rich foods, and their processing methods in order to mobilize the health status of the mother and the child at a community level. In order to further contribute to the sustainable development of the country and the world, it is important to emphasize the improvement of nutritional status, education of rural lactating mothers, enrichment of the diet with a variety of nutrient-rich foods, and awareness of the necessity of good nutrition. A modified "My Plate" approach to maternal nutrition is also advised by the United States Department of Agriculture (USDA), which places an emphasis on consuming lots of green and starchy vegetables, fruits with high water and potassium content, fortified cereal grains, low-fat and calcium-rich dairy products, and a variety of plant- or animal-based protein sources.

Limitations

Due to the brief duration of the study, time and resources were rather constrained. Interviews were used to complete the questionnaires, which has its own drawbacks. Anthropometric measurement of nursing mothers' nutritional status does not provide accurate results unless the biochemical approach and clinical assessment are combined.

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