ORIGINAL ARTICLE

Effect of Prenatal Dietary Pattern on Maternal Anemia and Low Birth Weight in Rural Areas of Kanpur

Ahmad Arif Siddiqui[1], Seema Nigam[2], Saif Anees[3], Tanu Midha[4]

[1]Postgraduate Student, Department of Community Medicine, Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh; [2]Professor, Department of Community Medicine, Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh; [3]Assistant Professor, Department of Community Medicine Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh; [4]Professor, Department of Community Medicine Government Medical College, Kannauj, Uttar Pradesh

Abstract	Introduction	Methodology	Results	Conclusion	References	Citation	Tables / Figures

Corresponding Author

Dr. Arif Ahmad Siddiqui, Postgraduate Student, Department of Community Medicine, Ganesh Shankar Vidyarthi Memorial Medical College, Kanpur, Uttar Pradesh 208002.
E Mail ID: dr.arif00786@gmail.com

Abstract

Background: In India, the dietary pattern of women from low socioeconomic status are almost same during pre-pregnant, pregnant and lactating periods. Additional foods are required to improve weight gain in pregnancy and birth weight of infants. **Aim & Objective**: To identify the impact of prenatal dietary pattern on maternal anemia and low birth weight in rural areas of Kanpur Nagar. **Methods**: This study was a cross sectional study conducted amongst mothers who recently delivered (RDW) in rural blocks of District Kanpur Nagar. Data was collected by interviewing study subjects using a semi-structured interview schedule after applying multistage random sampling technique. **Results**: Out of 102 women studied, 39.2% women had consumed >90 IFA tablets, 49.1% of mothers had practiced MMF and 47.1% of women practiced MDD during their prenatal period and 40.1% babies of current pregnancy were born as LBW. IFA consumption during pregnancy was significantly associated with maternal anemia. MMF during pregnancy was significantly associated with LBW. **Conclusions**: In our study it was found that IFA consumption, MMF and MDD during antenatal is a key preventive measure to reduce anemia status in pregnant females and birth weight of baby during prenatal period.

Introduction

In India, it has been noted that during pre-pregnancy, pregnancy, and lactation, the diets of women from low socioeconomic classes are essentially similar. As a result of widespread maternal malnutrition, low birth weight babies are common. To improve pregnancy weight and child birth weight more nutrients and calories must be obtained from maternal diet (1). In India, anemia is the leading cause of maternal death. Nutritional anemia occurs when a pregnant woman's intake of IFA supplements and specific nutrients is insufficient to meet the demands for the synthesis of hemoglobin and erythrocytes. Premature birth, LBW babies, and maternal, perinatal, and neonatal mortality have all been linked to anemia during pregnancy. Good dietary counselling provided by health service providers in the government health system can help to prevent nutritional anemia(2). We can lessen the burden of anemia in pregnant women and low birth weight babies by focusing on maternal nutrition, adequate meal frequency, and dietary diversity, and thereby reduce maternal and infant mortality(3). This fundamental aspect related to maternal and infant nutrition is accepted all over the world.

Aims & Objective

To identify the impact of prenatal dietary pattern on maternal anemia and birth weight in rural areas of Kanpur Nagar

Material & Methods

Study type: Observational, Cross-sectional study.
Study area: Rural Blocks of District Kanpur Nagar.
Study subject: Mothers of newborn.
Study Duration: July 2020 to August 2021.
Ethical Approval: Was obtained from the ethical committee of GSVM Medical College, Kanpur. Ref No: EC/302/Dec/2021

Sample Size calculation: To calculate the sample size, the main core MIYCN indicators were taken using the WHO core indicators guide(1) for MIYCN (24-11-2014). The prevalence of the core MIYCN indicator (anemia less than 11 gm. % in pregnant females) was derived from recent NFHS-4 Uttar Pradesh data. The minimum sample size was estimated and computed based on the following parameters:

$$\text{Minimum sample size} = \frac{Z^2\, PQ}{d^2}$$

Where Z = Standard normal variate whose value for 95% confidence interval is 1.96.

In order to calculate the sample size, a 95 percent confidence interval was used. The sample size of study subjects needed to meet the study's objectives was calculated to be 97. After adjusting for a 5% non-response rate, the sample size was increased to 102 moms who delivered within six months.

Newborn's mothers were interviewed to study the antenatal components to reduce the recall bias.

According to the 2011 census, Kanpur Nagar district has a population of 45.73 lakh people. The district has 10 rural blocks. In this study, the study subjects were chosen using a multistage simple random selection method. In the first stage of sampling, Kalyanpur block was selected from the list of 10 rural blocks by using a simple random sampling without replacement technique. In the second step of sampling, 16 villages from Kalyanpur block were randomly selected using simple random selection, and study subjects were also randomly recruited from each village to cover the optimum sample size required for the study's objective.

Inclusion criteria: Mothers who had recently delivered and who had given consent for participation in the study.
Exclusion criteria: if consent was not available for participation in the study.

Tools of data collection: The data was collected by interviewing study subjects using a semi-structured interview schedule. The interview schedule had contents about Biosocial profile of study subjects, antenatal services and counselling, prenatal IFA and Calcium supplementation, Minimum meal frequency, Minimum dietary diversity, anemia status at the time of delivery, birth weight of the child etc. To achieve interoperability, the interview schedule was first prepared in English, then translated to Hindi, and finally back to English. The questionnaire was piloted on 50 participants in Bairy

village, Kalyanpur, and then improved. The daily supervision for the entire data collection period has been accomplished and the questionnaire was reviewed and checked for completeness, accuracy and consistency. Information on background particulars of study subjects and specific information to fulfil the objective of the study was recorded on the prescribed interview schedule. The data was collected by using the direct personal interview method. The relevant data was collected and the master table was made accordingly.

The MIYCN project considered 3 big meals and 2 small meals (MMF) and at least 5 out of 10 food groups in daily meal (MDD) based on FAO guidelines (FAO, 2016) during the antenatal period for a healthy mother and child.

Data was entered into a trial version of SPSS version 27 and then analysed. Categorical variables were analysed using percentages and chi-square test. p-value of less than 0.05 was considered significant.

Results

The mean age of recently delivered mothers was 27.1 ±3.5 years. The majority of study subjects were Hindu by religion (72.5%), and Joint families accounted for 52.9 % of survey participants, while nuclear families accounted for 47.1 %. The bulk of the study participants (56.9%) were housewives, while 43.1 % were unskilled workers. The majority of recently delivered mothers were educated up to high school (31.3%) and 13.7% of mothers were graduates. The majority of study subjects, i.e.38.2%, belong to class IV, followed by class II (27.4%) and class III (26.4%), according to the Modified BG Prasad Scale AICPI 2020 (Table 1).

In this study, it was found that only 39.2% of women had consumed 91–180 IFA tablets during the antenatal period and more than 60% of women had consumed less than 90 tablets. It was found also that 49.1% of mothers had practised the minimum meal frequency (3 big meals and 2 small meals a day) during their antenatal period and 50.9% of mothers had not practised MMF during their antenatal period. The study also found that 47.1% of women met the MDD and 52.9% of newly delivered mothers did not consume 5 different types of foods daily during the antenatal period.

Mothers were asked to list the foods they ate on a regular basis during the prenatal stage. As shown in (Figure 1), the foods consumed were divided into food groups. All of the mothers (100%) ate grains and pulses on a daily basis, followed by 71.3 % of mothers who ate green leafy vegetables on a daily basis, and 64.4 % who ate milk and milk products. Eggs (27.3 %) and meat (20.5 %) were the least consumed foods by the mothers throughout the antenatal period.

After reviewing the MCP cards of the study subjects, it was discovered that 65.7% of mothers' RDW were anemic at the time of delivery, with 38.2% of those anemic mothers being mildly anemic and 8.8% of mothers being severely

anemic and it was also discovered that 40.1% of babies born during the current pregnancy had a low birth weight (2500 gm).

60.8 % of recently delivered mothers had ingested fewer than 90 IFA tablets during the prenatal period, and 82.2 % were anemic at the time of birth, whereas 39.2 % of moms who had consumed 91–180 IFA tablets during the antenatal period were anemic at the time of delivery. There was a statistically significant difference (p<0.05) between the number of IFA tablets consumed during pregnancy and the grade of anemia at the time of delivery of the baby in study subjects who had consumed less IFA tablets during the prenatal period (Table 2).

Among recently delivered mothers, 49.1% had not practised minimum meal frequency during the antenatal period, of which 74% of mothers were found anemic at the time of delivery and in 50.9% of mothers who had practised MMF, out of which 57.6% of mothers were found anemic and The difference between minimum meal frequency (MMF) during the antenatal period and anemia at the time of delivery of the child was found to be statistically not significant. (p>0.05**)** (Table 2)

Among total recently delivered mothers, 50.9% had practised minimum meal frequency during the antenatal period, of which 65.4% delivered babies with ≥ 2.5 kg wt. It was found that study subjects who practised MMF during the prenatal period had a lower chance of delivering babies with LBW and a statistically significant difference (p<0.05) was found between the daily minimum meal frequency of the mother during the ante-natal period and the birth weight of the baby. (Table 3)

In this study, it was seen that 47.1% of mothers had practised minimum dietary diversity during the antenatal period, out of which 68.6% delivered ≥ 2500gm weighted babies and 52.9% of mothers who had not practised MDD during pregnancy, in which 48.8% delivered low birth weight babies. The difference between the child's birth weight at the time of delivery and the minimum diet diversity (MDD) throughout the prenatal period was determined to be statistically not significant (p > 0.05). (Table.3)

Discussion

In our study, it was shown that nearly half of the mothers (56.8%) received 91-180 IFA tablets from health facility corroborated with the findings of other studies which stated that 65.2% of pregnant females received IFAS from health facility (3). In our study it was observed that only 39.9% of mothers consumed 91-180 tablets of IFA. Similar findings shown in the study of other authors that IFA consumption and calcium supplementation during pregnancy is less than 60% in rural areas of various states of India (3,4,5,6). The difference among the studies in IFAS consumption may be due to difference in education status, knowledge and awareness in study subjects of

rural and urban areas. It could be explained in part by the fact that pregnant women do not attend ANC on a regular basis, and hence do not receive an appropriate quantity of IFAS in rural areas. The variation from earlier studies could be related to the study subjects' educational status or differences in the counselling services available in that area.

In our study Maternal dietary intake was inadequate given that around half (47.1%) of the mothers attained the practice of minimum dietary diversity (MDD) during the antenatal period. contrary to the other studies reveals that MDD-W was low, indicating a low-quality diet, with 34% acceptable maternal diet variety (3,5,7,8,9) . During each trimester of the antenatal period, mothers were asked to list the foods they ate on a regular basis. The foods eaten were divided into food groups, as illustrated in the diagram (Figure-1). 100% of moms ate grains and pulses daily, followed by 71.3 % who ate green leafy vegetables daily, and 64.4 % who ate milk and milk products daily. The least consumed foods were eggs by 27.3% and meat by 20.5% of the mothers whereas other authors stated that during pregnancy consumption of variety of foods were like Starches (97.8%), other vegetables (72.5%), and milk and milk products were the most popular food groups (71%) (4,5). The most probable reasons for poor dietary intake were lack of food security purchasing power The difference in findings may be due to different food habits in that geographical area.

As there was no direct study found related to the association between tablet IFA consumption and status of anemia of pregnant females but our study found that the recently delivered mothers who consumed more IFA tablets during antenatal period had less chances to develop anemia at the time of delivery of child. Also there was a statistically significant association (p<0.05) found between the number of IFA tablets consumed during pregnancy and anemia status of pregnant female at the time of delivery of the child (Table-2). But many other authors stated that IFA consumption and Calcium supplementation as advised can maintain the hemoglobin level during whole pregnancy and even in postpartum period (6,10,11).

In the present study it was seen that mothers who had not maintained the MMF during pregnant stage had delivered with low birth weight baby and there was a statistically significant association between daily minimum meal frequency (MMF) of the mother during the ante-natal period and birth weight of the baby (Table-3). Similarly in other studies, authors observed that higher birth weight was linked to healthy food practices. "Unhealthy" food patterns, on the other hand, were related to lower birth weight and a higher chance of premature birth (all data-driven) (7,8,12). In our study it was also observed that various types of food eating habits i.e. minimum dietary

diversity (MDD) practiced during pregnancy was not significantly associated with the birth weight of the baby (Table-3). Similarly, other studies shown that MDD is not much related with the birth weight of the baby but it has paramount importance in improving macronutrient supplementation in pregnant females, they observed that MDD was not significantly associated with weight gain of the baby during pregnancy (6,7,8,12).

Conclusion

Overall, we found that increased IFA supplementation during the antenatal period can reduce anemia in pregnant women and increase adherence to good eating patterns with recommended foods. During pregnancy, low meal frequency and dietary diversity—defined as a dietary consumption of green leafy vegetables, seasonal fruits, whole grains, low-fat dairy, lean protein meals, milk, and meat—were linked to a lower risk of premature birth. This research is a significant step forward in the use of eating patterns to determine how to enhance public health and provide dietary guidelines. To encourage the use of suitable MIYCN practices, fully operationalize the Social and Behavior Change Communication Plan. Engage the community, including males and leaders, in a community debate about detrimental cultural practices like food taboos, which prohibit the intake of certain foods based on no scientific evidence. Develop contextualized treatments aimed at key influencers like the mother-in-law, who is the primary provider of prenatal feeding information

Recommendation

Fully operationalize Social and Behavior Change Communication Plan to promote adoption of appropriate MIYCN practices. Recruit nutritionists and counsellors at the health care facility. Establish a Multi-Sectoral Platform to enhance collaboration with nutrition-sensitive sectors in addressing nutrition issues. This will facilitate partnering and building complementarities amongst various partners in district Kanpur Nagar. MIYCN key indicators and massages should be included in various health schemes. IEC activities must be strengthened to create awareness among the community about mother infant and young child feeding recommendations. Promotion of female literacy and women empowerment is required to improve utilization of MIYCN services as it is highly associated with pregnancy outcomes.

Limitation of the study

All information like ANC services, IFA Tablets intake, dietary habits were based on recall which might have led to recall bias. The sampling frame was only from 1 rural block from district Kanpur Nagar. Dietary habits of rural and urban population are different so separate or comparative assessment of rural and urban population should have been done

Relevance of the study

The findings of this study meant to provide shreds of evidence to program managers and policymakers that IFA supplementation, MMF and MDD has paramount importance in improving hemoglobin status in pregnancy and birth weight of baby and this will help to design and implement appropriate interventions to improve the levels of inadequate MIYCN practices in pregnant females to reduce maternal and childhood malnutrition, morbidity and mortality in rural areas.

Authors Contribution

All authors contributed equally.

References

1. WHO/UNICEF, "Global Strategy for Infant and Young Child Feeding," 2003/9241562218.pdf
2. WHO, 2010, Indicators for assessing infant and young child feeding practices part 2: measurement. World Health Organization. Dept. of Child and Adolescent Health and Development. ISBN 978 92 4 159929 0 (NLM classification: WS 120
3. Ghosh-Jerath S, Devasenapathy N, Singh A, Shankar A, Zodpey S. Ante natal care (ANC) utilization, dietary practices and nutritional outcomes in pregnant and recently delivered women in urban slums of Delhi, India: an exploratory cross-sectional study. Reproductive health. 2015;12 (1):1-1.
4. Nguyen PH, Kachwaha S, Tran LM, Avula R, Young MF, Ghosh S, Sharma PK, Escobar-Alegria J, Forissier T, Patil S, Frongillo EA. Strengthening nutrition interventions in antenatal care services affects dietary intake, micronutrient intake, gestational weight gain, and breastfeeding in Uttar Pradesh, India: Results of a cluster-randomized program evaluation. The Journal of Nutrition. 2021;151(8):2282-95.
5. Maternal Infant and young child nutrition (MIYCN) knowledge, attitudes, beliefs and practices (KABP), survey report Tana river county (January 2018)
6. Wendt A, Stephenson R, Young M, Webb-Girard A, Hogue C, Ramakrishnan U, Martorell R. Individual and facility-level determinants of iron and folic acid receipt and adequate consumption among pregnant women in rural Bihar, India. PloS one. 2015;10(3):e0120404
7. Abubakari A, Jahn A. Maternal Dietary Patterns and Practices and Birth Weight in NorthernGhana. PLoS ONE 2016;11(9): e0162285
8. Chia AR, Chen LW, Lai JS, Wong CH, Neelakantan N, van Dam RM, Chong MF. Maternal dietary patterns and birth outcomes: a systematic review and meta-analysis. Advances in Nutrition. 2019;10(4):685-95.
9. Hiruy AF, Xiong Q, Jin Q, Zhao J, Lin X, He S, Abebe A, Zuo X, Ying C. The Association of Feeding Practices and Sociodemographic Factors on Underweight and Wasting in Children in Ethiopia: A Secondary Analysis of Four Health Surveys from 2000 to 2016. Journal of Tropical Pediatrics. 2021;67(4):fmab047.
10. Chourasia A, Pandey CM, Awasthi A. Factors influencing the consumption of iron and folic acid supplementations in high focus states of India. Clinical Epidemiology and Global Health. 2017;5(4):180-4.
11. Maternal and Child Health Integrated Program (2014). A guide for planning and implementing social and behaviour change

communication activities for postpartum family planning. https://toolkits.knowledgesuccess.org/toolkits/ppfp/guide-planning-and-implementing-social-and-behavior-change-communication-activities

12. Quyen PN, Nga HT, Chaffee B, Ngu T, King JC. Effect of maternal prenatal food supplementation, gestational weight gain, and breast-feeding on infant growth during the first 24 months of life in rural Vietnam. PloS one. 2020;15(6):e0233671.

Tables

TABLE 1 BIO-SOCIAL PROFILE OF STUDY SUBJECTS

Bio-Social Profile of Study Subjects		NUMBER	(n=102)
	Age in Years (MEAN ±SD)	27.1 ±3.5 YEARS	
Religion	Hindu	74	72.5
	Muslim	25	24.4
	Sikh	3	2.9
Type of Family	Joint	54	52.9
	Nuclear	48	47.1
Education	Illiterate	13	12.7
	Primary	18	17.6
	Middle	12	11.8
	High School	32	31.3
	Intermediate	13	12.7
	Graduate	14	13.7
Main Occupation of Mother	House Wife	58	56.9
	Un-Skilled Worker	44	43.1
Social Class (Modified BG Prasad Scale)	Class-I	5	4.9
	Class-II	28	27.4
	Class-III	27	26.4
	Class-IV	39	38.2
	Class-V	3	2.9

TABLE 2 ASSOCIATION BETWEEN ANEMIA STATUS OF RDW AT THE TIME OF DELIVERY AND NUMBER OF IFA TABLETS CONSUMED AND MMF PRACTICE DURING PREGNANCY

Minimum Meal Frequency	Anemia Status		Total	X^2=3.008 p=0.08 d.f.=1 c.i. 95%
	No anemia	Anemia		
Yes	22 (42.4%)	30 (57.6%)	52	
No	13 (26.0%)	37 (74.0%)	50	
Total	35	67	102	
Number of tablet IFA consumed	No anemia	Anemia	Total	X^2=19.26 **p<0.05** d.f.=1 c.i. 95%
≤ 90 tablets	11 (17.8%)	51 (82.2%)	62	
91-180 tablets	24 (60.0%)	16 (40.0%)	40	
Total	35	67	102	

TABLE 3 ASSOCIATION BETWEEN MMF AND MDD DURING PREGNANCY AND BIRTH WEIGHT OF DELIVERED CHILD

MMF practice during prenatal period	Birth weight of baby		Total	X^2= 3.92 p<0.05 d.f.=1 c.i. 95
	<2500 gm	≥ 2500 gm		
Yes	17 (34.6%)	35 (65.4%)	52	
No	29 (44.0%)	21 (56.0%)	50	
Total	36	66	102	
MDD practiced during prenatal period	<2500 gm	≥ 2500 gm	Total	X^2=0.157 **p=0.60** d.f.=1 c.i. 95
Yes	15 (31.5%)	33 (68.6%)	62	
No	26 (48.8%)	28 (51.2%)	40	
Total	41	61	102	

FIGURES

FIGURE 1 TYPES OF FOOD GROUPS EATEN DAILY DURING ANTENATAL PERIOD

FIGURE 1 TYPES OF FOOD GROUPS EATEN DAILY DURING ANTENATAL PERIOD