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Dietary Diversity in Rural Pregnant Women from KONKAN Region of Maharashtra, India (BKLWHANC-3)

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Abstract: *The DOHaD hypothesis has brought out the importance of maternal nutrition in the development of diabetes and other non-communicable diseases (hypertension, coronary heart disease) in the next generation. Women from KONKAN region have faced under nutrition throughout life course. Poor nutrition in pregnancy is a risk factor for mother as well as her baby. We explored nutritional status of rural pregnant women by examining their dietary diversity. The study was conducted in the antenatal clinic of a rural tertiary care hospital in the region. Total 214 pregnant women were enrolled. More than 90 % of pregnant women were enrolled at second trimester or beyond. The mean age was 27.2 ± 4.8 years. About 44 % were primiparous and 60% had only high school education. Mean weight, height and BMI were 49.8 ± 10.8 kg, 151.2 ± 5.5 cm and 21.7 ± 4.2 kg/m^2 respectively. The dietary diversity score was calculated using 24 hour dietary recall and scoring system designed by FAO-USAID as a part of FANTA III project. Mean dietary diversity score was 3.8 ± 1.3 and 25.3 % women achieved minimum dietary diversity. The women who were poorly educated had higher likelihood of poor dietary diversity. Our results have once again shown the urgency of improving nutrition of rural pregnant women of KONKAN. This will help in curtailing the rise of non-communicable diseases in the region.*

Keywords: *KONKAN, Nutrition, Dietary diversity, Pregnant women*

Abbreviations: *DDS: dietary diversity score*

1. Introduction

India is witnessing epidemic of type 2 diabetes (T2DM) and so other non-communicable diseases (NCD) (hypertension, heart disease and cancer). Indians are developing these at much younger age compare to western populations [1]. For more than 2 decades the country has been exposed to rapid effects of globalisation. This is reflected in rapid nutrition transition, change in life style behaviour and reduced physical activity. DOHaD hypothesis attributes intrauterine nutrition (under nutrition as well as over nutrition) of the fetus as the main cause of development of these diseases in adult life [2]. Despite rapid nutrition transition India still faces substantial burden of childhood and maternal malnutrition [3]. A recent report [4] has shown high neonatal and under-5 mortality in many regions of the country. The NCDs are also on the rise in rural areas [5].

KONKAN region of the western Indian state of Maharashtra has witnessed under nutrition across life course for many years [6]. B.K.L Walawalkar Hospital established 1995 is a tertiary care referral centre and caters to the health care needs of the community. Beyond treatment it also carries out various health awareness and health education programmes with holistic approach [7]. Occurrence of Low birth weight (LBW), NCD's is still very high in the region [8-10]. These facts point towards poor nutrition of women at various stages of life making DOHaD hypothesis very much relevant in the region. There is scarcity of data on macro as well as micronutrients status of the women in the region. Recently USAID -FAO have come

up with minimum dietary diversity score (DDS) which indicates diet quality as well as micronutrient adequacy for women of reproductive age. Poor dietary diversity has also been observed among adolescent girls (16-18y) from the region [11]. Persistence of poor dietary diversity during is likely to put the next generation at the risk of developing NCDs.

This manuscript explores dietary diversity among rural pregnant mothers of KONKAN region who visited antenatal clinic.

2. MATERIALS AND METHODS

The study was carried out in the antenatal clinic of the hospital between May 2021 and August 2021. Every pregnant women visiting antenatal clinic was enrolled after appropriate consent was obtained. They underwent various investigations which included current and previous obstetric history, anthropometry and nutritional assessment using 24 hour recall and questionnaire. Gestation of antenatal visit was calculated using last menstrual period. Hemoglobin measurements were carried out as a part of hospital protocol of pregnancy investigations.

2.1. Anthropometry

We measured height to nearest 0.1 cm using portable stadiometer (Easy care) and weight to nearest 100 gm using digital scale (OMRON).

2.2. Nutritional Assessment

Nutritional assessment was done using 24 hour recall. We calculated dietary diversity score (DDS) using 10 food categories as suggested in Food and Agricultural Organization and USAID's FANTA project for women of reproductive age [12]. Every item consumed was classified into relevant categories and assigned a score of 1. Cumulative score of 5 or more indicated adequate dietary diversity [11].

2.3. Ethics

The study was approved by the Institute Ethics Committee of BKL Walawalkar Rural Medical College and Hospital. Our institute ethics committee is registered with the Government of India. Our registration code is EC/755/INST/ MH/2015/RR-18.

2.4. Statistical Methods

The data has been represented as mean and standard deviation (SD) for continuous variables and percentages for categorical variables. Comparisons between groups were made by t test for continuous variables and by chi square test and odds ratios (OR) for categorical variables. Statistical package SPSS (v25.0) was used for analysis. P values of 0.05 or less were used as a cutoff for statistical significance.

3. RESULTS

A total of 214 pregnant women consented for participation in the study.

Table 1. *Characteristics of pregnant women at enrolment (n=214)*

Parameters	Mean ±SD or n (%)	Range (minimum-maximum)
Age (years)	27.2 ±4.8	18.8-41.2
<25 years	87 (40.6)	18.8-24.9
>25 years	127 (59.4)	25.0-41.2
Gravida	-	-
Primigravida	94 (43.9)	NA
Multigravida	120 (56.1)	2-5
Education (years)	10.3 ±3.0	0.0-17.0
0-10	129 (60.3)	0.0-10.0
>10	85 (39.7)	11-17
Gestation at enrollment	24.8±8.7	4.9-40.4
First trimester (< 12 weeks)	15 (7.1)	4.9-11.8
Second trimester (12-26 weeks)	97 (45.3)	12.4-25.8
Third trimester (> 26 weeks)	102 (47.6)	26.3-40.4
Weight (kg)	49.8±10.8	31.9-85.3
Height (cm)	151.2 ±5.5	135.5-166.3
BMI (kg/m^2)	21.7 ±4.2	14.1-37.7
Hemoglobin (gm%)	11.4±1.5	5.2-14.1
Anemia (Hemoglobin<12 gm%)	73 (34.0)	-

Mean (SD) for continuous variables and n (%) for categorical variables;

SD: Standard deviation; BMI: body mass index

Table1 shows characteristics of pregnant women at enrolment. More than 90 % of pregnant women were enrolled at second trimester or beyond. The mean age was 27.2 ± 4.8 years and around 59 % were 25 years or older. About 44 % were primiparous and 60% had only high school education. Mean weight, height and BMI were 49.8±10.8 kg, 151.2 ±5.5 cm and 21.7 ±4.2 kg/m^2 respectively.

Figure 1 shows the classification of foods consumed on previous day as suggested by FANTA [12] to calculate DDS.

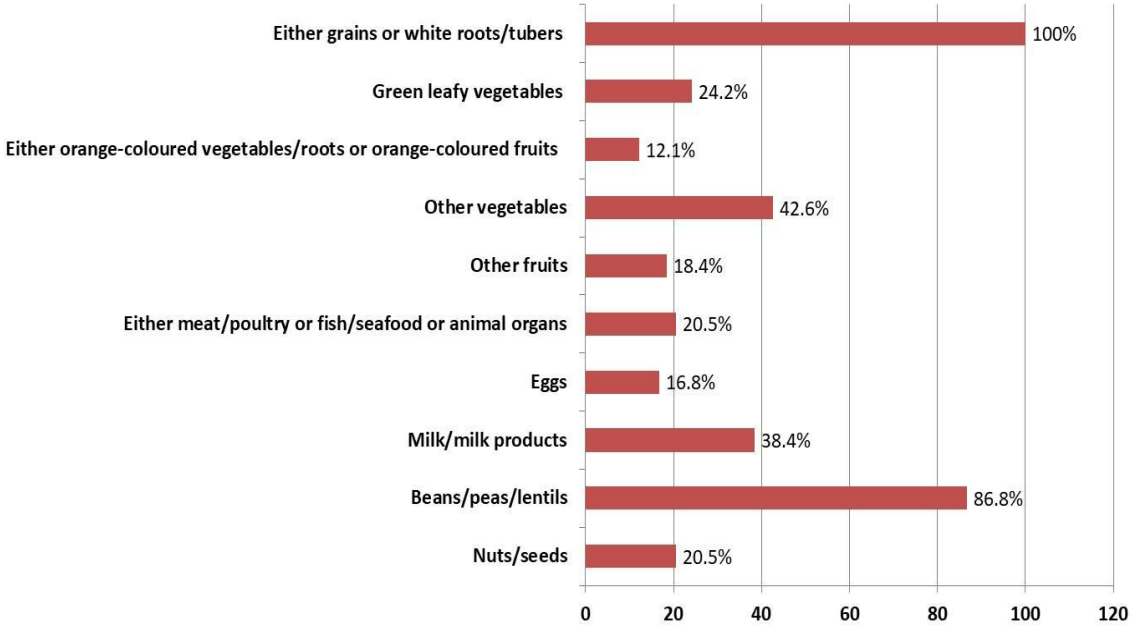

Figure 1. *Classification of foods consumed as reported in 24 hour recall (n=214)*

Table 2. *Distribution of dietary diversity score(n=214)*

DDS	n	(%)
1	1	0.5
2	32	14.7
3	55	25.8
4	72	33.7
5	39	18.4
6	8	3.7
7	4	1.6
8	2	1.1
9	1	0.5

DDS: dietary diversity score

Table 2 shows frequency distribution of DDS. Mean DDS was 3.8 ± 1.3. Total 25.3 % women achieved adequate dietary diversity which refers to proportion of women with DDS ≥5.

Table 3. *Associations between pregnancy characteristics and poor dietary diversity" (n=214)*

Characteristics	OR with 95% CI	P value
Age (<25 years)	1.46 (0.72-2.94)	0.291
Primigravida	0.77 (0.40-1.49)	0.441
Poor education (0-10 year)	2.66 (1.36-5.20)	0.003*
Registration at first or second trimester	2.06 (1.04-4.08)	0.035*
Anemia (Hemoglobin<12 gm%)	0.81 (0.40-1.65)	0.563

OR: odds ratio; "CI: confidence interval"

Table 3 shows odds ratios (OR) with 95% CI for associations between pregnancy characteristics and poor dietary diversity. The women who were poorly educated and registered before 3rd trimester in our clinic had significant OR for poor dietary diversity.

DDS was positively associated with weight (p=0.000) and BMI (p=0.000) (data not shown).

4. Discussion

We have reported dietary diversity of rural pregnant women from KONKAN region. This is the first report from the region. There are many reports on dietary diversity during pregnancy from many developing regions of the world. Most of the reports have used DDS designed by the Food and Agricultural Organization and USAID's FANTA project [12]. Poor dietary diversity predicted micronutrient inadequacy among women of reproductive age from north-eastern Indian state of Manipur [13]. In NFHS survey [14] of around 150000 children, adequate maternal food diversity had a protective effect on low birth weight. In a case (mother with LBW child) control (mother without LBW child) study from central Indian state of Madhya Pradesh [15] chance of LBW was reduced by 20% with increasing maternal dietary diversity. In a survey of 230 newly delivered women from northern Indian state of Uttar Pradesh [16], proportion of LBW was higher in those with low DDS. Another systematic review from low and middle-income countries [17] has also found association of poor maternal dietary diversity during pregnancy and LBW. Poor dietary diversity of 61% and 45% among pregnant women has been reported from China and Nepal respectively [18-19]. There are also reports about dietary diversity among pregnant women from Africa. High proportion of 61% - 80 % dietary adequacy among pregnant women has been observed in two reports [20-21] from Ghana and moderately high proportion of 40%-52% has been reported from Ethiopia [22-23]. Adequate dietary diversity of only 10 % was observed among 1000 pregnant women from African country of Cameroon [24]. We were able to find only one study from Benin region of Nigeria [25] with data on dietary diversity at preconception and during pregnancy. Study had a small sample size of 234 and dietary diversity did not differ between preconception and various trimesters of pregnancy. Our report is restricted only to pregnant women. There are some shortcomings. We do not have any data about micronutrient levels in blood. The haemoglobin measurement which was done as a part of pregnancy investigations was not associated with dietary diversity. We do not have any data on dietary diversity at preconception level though there is a report from our region on dietary diversity in late adolescents which can be treated as a preconception period [11]. Impact of dietary diversity on postnatal outcomes will be reported separately. As advised by [12] dietary diversity should not be used to screen individuals for selection for interventions or to identify individuals at risk for poor intakes. A systematic review from India about interventions to improve mother and child health has found moderate evidence of improvement in maternal dietary diversity among various women groups [26]. In our earlier report from the same region [11] only 3% adolescent girls had adequate dietary diversity. Thus adequate dietary diversity of 25.3% among pregnant women observed in our current study is higher than adolescent girls, still over all proportion of 25.3% is quite low. The question whether there is real improvement in dietary diversity from adolescence to pregnancy can be answered only by longitudinal study. Our current data is cross sectional. The 3 food groups from FANTA scale which had very poor consumption in adolescence were orange-coloured vegetables/ roots or orange-coloured fruits, milk/milk products and nuts/seeds [11]. The proportion of women consuming foods from these groups in pregnancy was fairly high (12.1%, 38.4% and 20.5% respectively) (Figure 1).

Almost 60% women in our data had only high school education, all of them were rural and there is hardly any awareness about importance of nutrition practices in pregnancy. This together with late registration (24 weeks) at the clinic makes chances of poor dietary diversity very high. Continuous health education and early registration in the antenatal clinic will be the only way to generate diet awareness and bring into practice. Consumption of certain foods (fruits, milk/milk products and dry fruits) in pregnancy is highly emphasized in Indian culture with the belief that it helps in better pregnancy outcome. This might have contributed to better dietary diversity of 25.3% in pregnancy.

5. Conclusion

Our data though cross sectional has reconfirmed the poor nutritional status of pregnant women in KONKAN. There is a need for subsequent research to investigate specific micronutrient

deficiencies, food security and food availability in the region. The rising prevalence of NCDs in KONKAN and poor nutritional status of pregnant women needs urgent attention which will eventually help in reduction in the risks for NCDs.

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