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Prevalence of Anaemia during Pregnancy and its Correlates in Meghalaya State, India

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ABSTRACT

Anaemia during pregnancy adversely affects maternal and fetal outcomes. It is a major problem globally and in India. Despite much progress in provision of public health services, the high burden of prenatal anaemia continues and Supplementation with iron and folate tablets have had low impact. Despite rich biodiversity and high literacy rates, women in Meghalaya seem to suffer from high anaemia during pregnancy and there is scarce published research. Studies were done in South West Khasi Hills of Meghalaya state during 2018-20, on anaemia during pregnancy. Nearly 500 Mothers were personally interviewed while pregnant after informed consent Hemoglobin levels were assessed through standardized techniques and graded(g/100ml) as Normal: 11 or more, Mild:9-11, Moderate: 7-8.9 and Severe: <7 The research proforma was validated by experts subjected to essential pilot studies, computerized dsing Microsoft excel sheets, and analysed using SPSS software. The research was approved by the University Research and Ethics Committee(UREC) Formal informed consent was obtained from each respondent .Of 539 pregnant women interviewed, 32 had no antenatal checkup and hence the analyses done on the 507 women. Overall prevalence of anaemia was 38.1%, (95% Confidence Interval from 33.9% to 42.3%). The majority had mild anaemia, but significant numbers had moderate or severe anaemia causing concern. 34.1% mothers in their first trimester ,37.9% in their second trimester and 39% in their third trimester (39.1%) had anaemia; 30.6% of primigravidae women as compared to 69.4% of multigravidae have anaemia,38.6% of younger women less than 25 years, 38.3% in ages 25-34 and 36.9% in the oldest age group above 35 years are anaemic. 37.5% of illiterate women 36.8% of intermediate level 43.2% of well-educated were anaemic. On the other hand, 34.1% of mothers from nuclear families but 45.7%, from joint families have anemia However none of the differences are statistically significant. Prevalence of Anaemia during pregnancy is high in women of south west khasi hills district of Meghalaya. Multigravida, large families, poor knowledge and attitudes, improper and inadequate nutritious diets seem to be major factors to be addressed urgently.

1. Introduction

Anaemia during pregnancy continues to be a global problem which impairs not only the health and well-being in women but increases the risk of adverse maternal and neonatal outcomes(WHO 2008;Bora et al 2014; Kumar et al 2013 ; Stevens et al 2013). The prevalence of anaemia was highest in south Asia and central and west Africa. Several biological, socioeconomic and cultural factors underly the occurrence of anaemia in women,and it is estimated that half of cases are due to iron deficiency(Sharma et al 2013;Gillespie, 1998). In some settings, it was reported that some reductions in the prevalence of anaemia have been achieved through public health interventions(Bharati et al 2015; Kalaivani 2009); however, overall,

progress has not been impressive(Balarama et al 2012). Recent studies in India has once again documented the heavy burden of anaemia in pregnant and lactating women in India (Agarwal et al 2006) and recommended more aggressive and comprehensive actions to reach the World Health Assembly target of a 50% reduction of anaemia in women of reproductive age by 2025 (WHO,2008).

The burden of prenatal anaemia in India varies widely from 20% to over 80% (Sinha et al 2006) and more so in the northeast region of India among indigenous populations. A few studies have addressed in general the issue of high prevalence of anaemia among women in Assam(Nair et al 2016) and as part of biodiversity and child malnutrition in one area of Meghalaya state(Chyne et al 2017)) have incidentally confirmed the high prevalence of anaemia in adolescents and adult women. Bora et al (2014) reported a high prevalence of anemia in pregnant women and its effect on neonatal outcomes in Northeast India. Part of the variabilities could be due to methodological and technical aspects of estimating anaemia, and standardized in-depth studies are needed to assist in better policy decisions and programmatic changes.

There has been much progress in maternal and child health services in government and private sectors with detection of prenatal anaemia through testing of haemoglobin and provision of iron and folate tablets where needed. However there seems to be weak public response and the impact seems to be negligible in terms of prevailing levels of prenatal anaemia and its consequences on adverse neonatal outcomes (Rohilla et al 2010).There needs to be more emphasis in addressing sociocultural issues(Passah and Limbu, 2020), effective advocacy of better diets or food security for pregnant and lactating women(Monsang and Singh, 2018; Alonso 2015)). Despite rich resources and high literacy rates, it is surprising why women in Meghalaya have a high burden of anaemia (Albert 2016)Hence, a major research project was embarked upon in South West Khasi Hills of Meghalaya state on sufficiently large numbers of mothers documenting the utilization of maternity and child health services and identifying issues of prenatal anaemia during 2018-20. In this paper, we briefly highlight the methodology, findings on pregnant women and discuss possible solutions.

2. Material and Methods

Meghalaya state is situated in the Northeast India with Shillong is its capital and a population of 29,66,889 persons (2011 census) of which 14,91,832 are males and 14,75,057 are females. Meghalaya is a predominantly tribal state of Khasis, Garos and Jaintia tribes and is reputed to have historically followed the matrilineal system. Even with a high literacy rate (Males 75.95% and 72.89% females),Meghalaya state shows poor health indicators (Nongkynrih,2013; Albert 2016). According to the record on Maternal deaths of Meghalaya, the state has a high MMR which stands at 211 in 2015-16. It also has one of the highest Infant Mortality Rate (IMR) amongst the smaller states in the country (SRS Bulletin, 2011).

From the eleven districts of Meghalaya, South West Khasi Hills district was purposively chosen for the study which is a new district carved out of the West Khasi Hills District on 3 August 2012 with district headquarters at Mawkyrwat. From each of the two blocks in this district i.e., Mawkyrwat (Pop.57854) and Ranikor (40789) , a representative random cluster sample of villages were chosen to provide a minimum of 400 households in eack block. Assuming a Birth Rate of 35 per 1000 population, an estimate of 30% prenatal anaemia, with a type I error of 5%, power of 80% and a precision of 20%.A. allowing for some nonresponse, the minimum sample size was estimated as 500 pregnant women.

A detailed in-depth interview schedule was developed to ascertain basic socioeconomic, cultural and reproductive history of each respondent, and then record the utilization of each maternal and child health services offered by the government health centres including laboratory investigations, physical examinations and utilization of health insurance facilities. The knowledge, attitudes and practice relating to maternal care were also assessed with special emphasis on preventive and promotive care. Hemoglobin levels were assessed through haemoglobinometer using standardized techniques at first contact and graded as Normal: 11 mg/dl or more, Mild anaemia:9-11 mg/dl, Moderate anaemia: 7-8.9 mg/dl and Severe: <7 mg/dl. (WHO 2011) Iron and folate tablets were provided for all those detected with anaemia. The research proforma was validated by experts and subjected to essential pilot studies before finalization. All data were routinely entered onto Microsoft excel sheets, edited and corrected periodically and used for monitoring and follow-up. Analyses were done using SPSS and various indicators determined. The research protocol was approved by the Martin Luther Christian University Research and Ethics Committee (UREC) on July 19, 2018 , Ref.EA/272/2015-. Formal informed consent was obtained from each respondent assuring them of anonymity, confidentiality and security of data collected. The researcher personally carried out the interviews after necessary clearances from the family and after building necessary rapport with the respondent. There was full cooperation.

3. Findings

.Of the 539 pregnant women, 32 did not go for any antenatal checkup and hence the analyses are made on the 507 women. At the time of interview, 44 mothers were in their first trimester of pregnancy, 261 in their second trimester and 202 in their third trimester, Based on the standard method of estimating hemoglobin level, those less than 11 gm/100ml were considered as "anaemic". The findings show that 15 out of 44 in their first trimester (34.1%), 99 out of 261in their second trimester (37.9%) and 79 out of 202 in their third trimester (39.1%) are detected to have prenatal anaemia; i.e. a total of 193 out of 507, works out to 38.1%, with the 95% Confidence Interval from 33.9% to 42.3% . Thus, at least one-third of pregnant women in south west khasi hills district are anaemic, which is a serious problem needing prompt attention

The Severity of Anaemia by trimester of pregnancy is shown in Table 1

Table 1 Severity of Prenatal Anaemia by trimester

	Trimester			
Status of anemia	**1st**	**2nd**	**3rd**	**Total**
	No (%)	**No (%)**	**No (%)**	**No (%)**
Mild anemia	13 (86.7)	87 (87.9)	73 (92.4)	173 (89.6)
Moderate anemia	2 (13.3)	9 (9.1)	5 (6.3)	16 (8.3)
Severe anemia	0 (0.0)	3 (3.0)	1 (1.3)	4 (2.1)
Total	15 (100.0)	99 (100.0)	79 (100	193 (100.0)

Nearly 10% have moderate or severe anaemia, and the high moderate anaemia even in the first trimester will obviously impact on the pregnancy outcomes.

In terms of age of mothers, 49 out of 127 (38.6%) among younger women less than 25 years, 106 out of 277 (38.3%) in ages 25-34 and 38 out of 103 (36.9%) in the oldest age group above 35 years

Regarding severity of anaemia, nearly 96% of youngest women and over 80% of others have mild anaemia as presented in table 2.

Table 2: Severity of anaemia by Age of Mother

	Current Age (in years)			
Level of Anemia	**Up to 25**	**25-34**	**35 and over**	**Total**
	No.(%)	**No.(%)**	**No.(%)**	**No.(%)**
Mild anemia	47 (95.9)	94 (88.7)	32 (84.2)	173 (89.6)
Moderate anemia	2 (4.1)	9 (8.5)	5 (13.2)	16 (8.3)
Severe anemia	0 (0.0)	3 (2.8)	1 (2.6)	4 (2.1)
Total	49 (100.0)	106 (100.0)	38 (100.0)	193 (100.0)

Two mothers under 25 years already have moderate anaemia and 4 mothers have severe anaemia

Analyses by gravidae show that 59 out of 142 primigravidae women (30.6%) and 134 out of 397 multigravidae women (69.4%) women have anaemia, the Severity of anaemia by gravida is presented in Table 3

Table 3: Severity of anaemia according to Gravida

	Primi gravida		
Level of anemia	**Yes**	**No**	**Total**
	No.(%)	**No.(%)**	**No.(%)**
Mild anemia	58 (98.3)	115 (85.8)	173 (89.6)
Moderate anemia	1 (1.7)	15 (11.2)	16 (8.3)
Severe anemia	0 (0.0)	4 (3.0)	4 (2.1)
Total	59 (100.0)	134 (100.0)	193 (100.0)

It is critical that anaemia in primigravida be taken care of immediately. The high prevalence of anemia in multigravida could be due to multiple repeated pregnancies without proper spacing or inadequate food intakes due to intrafamily distribution of food.

Apparently the educational status of the mothers seems to have no influence on the prevalence of anaemia , as 56 out of 149 illiterate women (37.5%) 102 out of 277 intermediate level (36.8%) and 35 out of 81 well educated (43.2%) were detected to have anemia. The Severity of anaemia according to their educational status is shown in Table 4

Table 4: Severity of anemia by Educational status of mothers

	Educational status			
Level of anaemia	**Iliterate up to primary**	**Completed upto secondary**	**Beyond secondary**	**Total**
	No.(%)	**No.(%)**	**No.(%)**	**No.(%)**
Mild anemia	47 (83.9)	92 (90.2)	34 (97.1)	173 (89.6)
Moderate anemia	7 (12.5)	9 (8.8)	0 (0.0)	16 (8.3)
Severe anemia	2 (3.6)	1 (1.0)	1 (2.9)	4 (2.1)
Total	56 (100.0)	102 (100.0)	35 (100.0)	193 (100.0)

However there is a statistically significant association of severity of anaemia with educational status, with nearly 16% of illiterate mothers having moderate or severe anaemia, 10% among intermediate level and just 3% among women with higher education.

It seems that the type of family is associated with the prevalence of anaemia as 117 out of 341women in nuclear families (34.1%) and a higher percentage 45.7%, 76 out of 166 women in joint families were detected to have anemia; but the difference was not statistically different.The Severity of anaemia by type of family is given in Table 5.

Table 5: Severity of anaemia by Type of family

	Type of family		
Severity of anaemia	**Nuclear family**	**Joint family**	**Total**
	No.(%)	**No.(%)**	**No.(%)**
Mild anemia	102 (87.2)	71 (93.4)	173 (89.6)
Moderate anemia	12 (10.3)	4 (5.3)	16 (8.3)
Severe anemia	3 (2.6)	1 (1.3)	4 (2.1)
Total	117 (100.0)	76 (100.0)	193 (100.0)

Women who had moderate and severe anaemia is higher in women who are living in nuclear family (12.9%) compared to women who are living in joint family (6.6%). This needs further enquiry.

4. Discussion

Prevention and efficient management of anaemia during pregnancy seems to be a challenging task in indigenous as well as in low and middle income countries as seen from the continuing high levels despite several public approaches(WHO 2008).It is possible that anaemia was pre-existent prior to pregnancy due to several socioeconomic and dietary factors. However there seems to be low awareness on association of prenaal anaemia with mortality and morbidity in the mother and baby,including risk of miscarriages, stillbirths, prematurity and low birth weight.(Balarajan et al 2012). Anaemia and iron deficiency reduce individuals' well-being, cause fatigue and lethargy, and impair physical capacity and work performance (Sinha et al 2006). Failure to reduce anaemia worldwide consigns millions of women to impaired health and quality of life, generations of children to impaired development and learning, and communities and nations to impaired economic productivity and development. (WHO,2008).

The present research has shown significant associations of anaemia with type of family, multigravida but not with educational status. Intra-family distribution of food in large families with poor food intakes and quality of diet have been reported (Harris-Fry et al 2017). In their studies in villages of Mysore state in south India, Krupp et al (2018) have strongly emphasized the decision making power within the family and the possibly low priority for pregnant women. Further, in most indigenous populations, food taboos and misconceptions on dietary intake during pregnancy are rampant (Alonso 2015) leading to high nutritional deficiencies including anaemia.In such populations, most women have negative attitudes to consuming pills of any kind during pregnancy, including iron and folate tablets.

Iron deficiency is the most common cause of anemia, although other nutritional deficiencies and various disorders affecting erythrocyte production and function are also contributory factors [Gillespie, 1998; Kumar et al 2018]. Iron-deficiency anemia control, and micronutrient malnutrition programming more generally, has historically relied predominantly on supplementation and fortification, whilst 'foodbased' approaches have received correspondingly less attention [Ruel 2001; Chyne et al 2017]. However, the last few years have witnessed a surge of interest in understanding agriculture-nutrition linkages and shaping agriculture and food sector initiatives to achieve nutrition outcomes [Dangour et al 2012]. Modern medicine and public health approaches place excessive reliance on pills and most maternal and child health services offer iron and folate tablets for any woman diagnosed with anaemia. Most women do not consume these tablets and avoid health centres and health workers who may insist on taing these drugs. Very little emphasis is placed on alternative methods of preventing and managing prenatal anaemia such as better and more nutritious food intakes, and greater decision-making power in choosing iron-rich foods, many of them locally available. Aggressive health education programmes are necessary to win over the misconceptions and poor dietary habits during pregnancy. The role of culture in a tribal society in terms of dietary habits and practices during pregnancies, and food distribution within the family must be explored further (Alonso 2015; Ghosh-Jerath et al 2016)

Anemia in pregnancy has been associated with poor maternal and infant outcomes (Scholl, 2005). In India, it is thought to contribute to about 40% of the country's maternal deaths (Registrar General of India, 2004). A tertiary hospital in northern India found that severely anemic pregnant women had a higher risk of premature rupture of membranes, hypertensive diseases of pregnancy, abruption, congestive cardiac failure, and postpartum hemorrhage (Rohilla, 2010). Anemia in pregnancy is a socially patterned phenomenon that disproportionally affects rural, low-income, and socially marginalized women (Bharati et al., 2008; Bharati et al., 2015). Several studies have confirmed this association (Bisoi, 2011; Sharma et al., 2013).

In a study done in West Khasi Hills District in Meghalaya state, Chyne et al (2017) found Child undernutrition and micronutrient deficiencies are unacceptably high and recommended that Education and behavioral change communication for better food intake during pregnancy and lactation as well as child feeding practices are needed to improve child undernutrition. They also felt that wild food resources form an indispensible part of Khasi culture suggesting a strong bond with nature, and .Community-based strategies need to be developed to utilize the available wide food biodiversity to effectively improve the Khasi people's food security, nutrition, and health.

Nair et al(2016) designed a Retrospective cohort study to examine the association between maternal anaemia and adverse maternal and infant outcomes,using anonymised hospital records of 5 government medical colleges in Assam, where 1007 pregnant women delivered from January to June 2015. The main outcome measures were ORs with 95% CIs to estimate the

association between maternal iron deficiency anaemia and the adverse maternal and infant outcomes. Potential interactive roles of infections and induction of labour on the adverse outcomes were explored.

The results showed that 35% of 351 pregnant women had moderate–severe anaemia. Women with severe anaemia had a higher odds of PPH (adjusted OR (aOR) =9.45; 95% CI 2.62 to 34.05), giving birth to low birthweight (aOR=6.19; 95% CI 1.44 to 26.71) and small-forgestational age babies (aOR=8.72; 95% CI 1.66 to 45.67), and perinatal death (aOR=16.42; 95% CI 4.38 to 61.55)..

Considerable research on anaemia in women has been undertaken globally and in India, but clear-cut feasible guidelines are lacking. Unless relevant research is done to answer specific questions on causative, promotive and constraining factors that reduce and prevent prenatal anaemia, the outcomes on the welfare of mother and new-born will remain adverse. The solutions for an indigenous population are likely to be different in another society, and the maternal services must be sensitive to the cultural background of the people concerned, Meghalaya is fortunate to have great biodiversity with rich food sources, a hard working simple Khasi lifestyle, and an acceptable public health solution must be formulated and implemented to enhance the quality and survival of mothers and children. However, the habits of chewing tobacco and areca nut and other lifestyle behaviour such as alcohol drinking has effects on anaemia levels among the women (Chauhan *et al.,* 2015; Rynjah et al 2009). Nutritional knowledge of the tribal adult women is generally unsatisfactory and they need in-depth nutrition education and intervention programmes for their holistic development (Devi and Sindhuja, 2015). Several studies have also revealed that intake pattern of various foodstuff and nutritional knowledge and practices of the selected tribal women were not satisfactory up to the standard of living.(Monsang and Singh 2018; Passah and Limbu 2020);Anaemia among women in Meghalaya state and in other areas of northeastern India is therefore multifactorial and the MCH services must recognize the need for a more comprehensive approach and just doling out iron and folate tablets.

5. Conclusions

Prevalence of anaemia during pregnancy in south west khasi hills district of Meghalaya is unacceptably high and needs a multipronged approach using innovative and participatory approaches. Education on diets during pregnancy, empowering women in decision-making, optimal distribution of food intakes, family planning with proper spacing between births, good hygienic practices and better life-styles will all help. Health workers and health systems must be sensitized to the seriousness of anemia during pregnancy and intensify education, counselling and advocacy programmes.

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References

[1] Agarwal KN, D.K. Agarwal DK, Sharma A, SharmaK, Prasad K, Kalita MC, Khetarpaul N, Kapoor AC, VijayalekshmiL, Govilla AK, Panda SM & Kumari P. (2006). Prevalence of anaemia in pregnant & lactating women in India. *Indian J Med Res*, 124, 173-184

[2] Albert, S. (2016). Why are the women of Meghalaya so anaemic? The Shillong Times.

[3] Alonso E. (2015). The impact of culture, religion and traditionalknowledge on food and nutrition security in developing countries FOODSECURE Working paper no. 30 FOODSECURE project officeThe Hague, Netherlands

[4] Balarajan Y, Ramakrishnan U, Özaltin E, Shankar AH, Subramanian S. (2012). Anaemia in low-income and middle-income countries. *The Lancet*, 378, 2123–2135.

[5] Bharati P, Som S, Chakrabarty S, Bharati S, Pal M. (2008). Prevalence of anemia and its determinants among nonpregnant and pregnant women in India. *Asia Pac J Public Health, 20*(4), 347–359.

[6] Bharati S, Pal M, Som S, Bharati P. (2015). Temporal trend of anemia among reproductive-aged women in India. Asia Pac J Public Health. 27, 1193

[7] Bisoi S, Haldar D, Majumdar TK, Bhattacharya N, Sarkar GN, Ray S. (2011). Correlates of Anemia among Pregnant women in a Rural Area of West Bengal. *The Journal of Family Welfare, 57*(1),72– 78

[8] Bora R, Sable C, Wolfson J, Boro K, Rao R. (2014). Prevalence of anemia in pregnant women and its effect on neonatal outcomes in Northeast India. *J Matern Fetal Neonatal Med, 27*(9),887–891.

[9] Chauhan, S. K., Jungari, S., and Chauhan, B.G. (2015). Burden of Anaemia amon,Women in Jharkhand, India: Does Lifestyle Behaviour Matters? J. *Nutri. Health, 1*(2), 1-9.

[10] Chyne DAL, Meshram II, Rajendran A, et al. (2017) Nutritional status, food insecurity, and biodiversity among the Khasi in Meghalaya, North-East India. *Matern Child Nutr. 13*(3) https://doi.org/10.1111/mcn.12557
[11] Dangour AD, Green R, Häsler B, Rushton J, Shankar B, Waage J(2012). Linking agriculture and health in low and middle-income countries: an interdisciplinary research agenda. Proceedings of the Nutrition Society, 71, 222–228.
[12] Devi, T. A., and Sindhuja, S., 2015. Nutritional status and knowledge, life style and dietary practices of tribal adult women. *International Journal of Recent Scientific Research, 6* (6), 4449-4452
[13] . Ghosh-Jerath, S., Singh, A., Magsumbol, M.S., Lyngdoh, T., Kamboj, P., and Goldberg, G., (2016). Contribution of indigenous foods towards nutrient intakes and nutritional status of women in the Santhal tribal community of Jharkand, India. *Public Health Nutrition, 19* (12), 2256-2267
[14] Gillespie S(1998). Major issues in the control of iron deficiency. Ottawa: The Micronutrient Initiative and UNICEF; 1998
[15] Government of India. (2011) Census of India 2011.
[16] Harris-Fry H , ShresthaN, CostelloA and SavilleNM. (2017). Determinants of intra-household food allocation between adults in South Asia – a systematic review International Journal for Equity in Health, 16, 107
[17] Kalaivani K. (2009). Prevalence & consequences of anaemia in pregnancy. *Indian J Med Res, 130*(5), 627–633.
[18] Krupp, K, Placek CD, Wilcox M, Ravi K, Srinivas V, Anjali A, and Madhivanan P. (2018). Financial Decision Making Power is associated with Moderate to Severe anemia: A Prospective Cohort Study among Pregnant Women in Rural South India Midwifery, 61, 15–21.
[19] Kumar KJ, Asha N, Murthy DS, Sujatha M, Manjunath V. (2013). Maternal anemia in various trimesters and its effect on newborn weight and maturity: an observational study. *Int J Prev Med, 4*(2),193– 199. [PubMed: 23543625
[20] Monsang ES and Namita Singh S(2018) Prevalence of Anaemia and Nutritional Knowledge among Tribal Women of Reproductive Age Group of Meghalaya, *India Int.J.Curr.Microbiol.App.Sci, 7*(10), 1221-1229
[21] Nair M, Choudhury MK, Choudhury SS, et al.(2016). Association between maternal anaemia and pregnancy outcomes: a cohort study in Assam, India. BMJ Global Health 2016;1:e000026. doi:10.1136/bmjgh-2015-000026
[22] Passah MC and.Limbu DK. (2020). Prevalence of Anaemia and its association with sociodemographic factors among the Pnar women of Jowai Town,West Jaintia Hills District, Meghalaya, India. *Journal of Anthropology, 16*(1) 203-210
[23] Registrar General of India. [Accessed on October 2, 2017] Maternal Mortality in India 1997-2003. 2004. http://censusindia.gov.in/Vital_Statistics/SRS_Bulletins/MMR-BulletinApril-2009.pdf
[24] Rohilla M, Raveendran A, Dhaliwal LK, Chopra S. (2010). Severe anaemia in pregnancy: a tertiary hospital experience from northern India. *J Obstet Gynaecol, 30*(7), 694–696.
[25] Ruel M. (2001) Can food-based strategies help reduce vitamin A and iron deficiencies? Washington, DC: International Food Policy Research Institute (IFPRI).
[26] Rynjah, R., Anuradha, V., and Thilagamani, S., (2009). Nutritional status of tobacco users among the khasi tribes in Meghalaya. *Indian Journal of Nutrition and Dietetics, 46*(9), 357-363.
[27] Sharma JB, Soni D, Murthy NS, Malhotra M. (2003). Effect of dietary habits on prevalence of anemia in pregnant women of Delhi. *J Obstet Gynaecol Res, 29*(2):73–78. [PubMed: 12755525]
[28] Sharma P, Mehta S, Nagar R. (2013). Prevalence of anemia and socio-demographic factors associated with anemia among pregnant women attending antenatal Hospital in Jaipur City, India. *IOSR Journal of Pharmacy and Biological Sciences, 6*(3):15.OI:10.3109/01443615.2010.509821 [PubMed: 20925612].
[29] Sharma S , Akhtar F, Singh RS, and Mehra S. (2020). Dietary Intake across Reproductive Life Stages of Women in India: A Cross-Sectional Survey from 4 Districts of India Hindawi Journal of Nutrition and MetabolismVolume Article ID 9549214, 13 pages
[30] .Sinha M, Panigrahi I, Shukla J, Khanna A, Saxena R(2006). Spectrum of anemia in pregnant Indian women and importance of antenatal screening. *Indian J Pathol Microbiol, 49*(3), 373–375.
[31] Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F, et al. (2013). Nutrition Impact Model Study Group. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. *The Lancet Global Health, 1*(1), 16–25
[32] World Health Organization(2008). Worldwide prevalence of anaemia 1993–2005. (2008). Found at: http:// www.google.com/url?pregnant women and adolescent girls in 16 districts of India. Food Nutr Bull, 27(4):311– 315.
[33] WHO(2011). Hemoglobin concentrations for the diagnosis of anemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva: World Health Organization (WHO).