



NUTRITIONAL KNOWLEDGE AND PRACTICE AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC IN OSUN STATE

¹Akinola O.O, ²Mosimabale M.M, ³Akinyemi A.O, ⁴Hammed I.A ⁵Oguntade O.I, ⁶Ogbonna O.C,
and ⁷Orji I.G

^{1,2,4,5,7}Department of Nutrition & Dietetics, Federal Polytechnic, Ede, Nigeria

³Dietetics Department, Osun State University Teaching Hospital, Osogbo, Nigeria.

⁶Dietetics Department, Obafemi Awolowo University Teaching Hospital Complex Ile Ife, Nigeria.

Email of the Corresponding Author: ooakinola@yahoo.com

Abstract: Pregnant women are more vulnerable to malnutrition and infections due to their physiological requirements and during pregnancy, good nutritional intake has been identified as a vital factor for good pregnancy and anticipated birth outcomes. The study assessed nutritional knowledge and practice of nutrition among pregnant women attending antenatal clinics in Osun State. Purposive Cross-sectional sampling technique was adapted in selection of three hundred participants from different hospitals in the three senatorial districts of Osun State. The researcher adapted a well-structured questionnaire to collect information from the selected participants. Descriptive statistics of Percentage, means, Standard Deviation, and thus Chi-square to find an association among the variables using the Statistical Package for the Social Science (SPSS) version (25.0). The results showed that the highest 92 (30.7%) among the age distribution of the participants was between 20-24 years, 127(42.3%) had tertiary education, and 25(8.3%) were illiterate, 71.3% and 12.4% had knowledge of additional nutrients intake during pregnancy and have no idea respectively. There was a significant relationship between dietary practices and the nutritional status of pregnant women attending ante-natal clinics. In conclusion, there is need for nutritional education and aggressive enlightenment for women of reproductive age at all levels to be utilizing maternal health care services which are freely available in most primary health care systems to reduce the level of childhood morbidity and mortality among pregnant women.

Keywords: Ante-natal, Knowledge nutritional status, Practice, and pregnant women.

Introduction

Nutrition is a central and fundamental pillar of human life that is required for health and development throughout the entire life span in general and during pregnancy in particular. During pregnancy, a nutrient requirement is considered to be the amount necessary to replace obligatory maternal nutrient losses and to allow for normal growth of foetal and maternal tissues and for accretion of nutrient stores, more so maternal nutrition during pregnancy has been recognized as an essential element of birth weight. According to (Ojofeitimi, et. al., 2018), in developing countries, a high rate of Low Birth Weight (LBW) has been ascribed to deprived maternal nutrition. That is developing foetus consumes a lot of nutrients from the mother to improve psychological growth. Similarly, there is high demand for nutrients by the mother due to developing foetus. Thus, poor health and nutrition of women of reproductive age and the lack of care contributes to death rate during pregnancy and in child birth; this also compromises the health and survival of the infants and children (Abdella, 2014). In addition, undernutrition has irreversible effects on the foetus during pregnancy and in the first two years of life, and this effect reflect on the early damage to health, brain development, intelligence, cognitive, and productivity. (Shekare et. al., 2016). Also, the physiologic changes that occur in pregnancy stimulate some homeostatic responses, regardless of the nutritional status of the mother, thereby increasing the supply of nutrients to help meet increased demands (Heaney and Skillman, 2017)

World Health Organization (WHO) (2012), indicated that most women of reproductive age and pregnancy lack adequate intake of micronutrients that is their diet does not contain enough of it. Also, many women don't get enough iron, folate, calcium, vitamin D, or protein, thus, it is important to increase the intake of healthy diet that includes plenty of fruits, vegetables, whole grains, and proteins. The nutritional status of women is very

significant in children's life, now and to future generations if the vicious circle is not broken in terms of malnutrition (Cetin and Laoreti, 2015).

Antenatal care (ANC) is a critical strategy in reducing maternal mortality as it facilitates the identification and mitigation of risk factors early in pregnancy (Bhutta et al., 2014). In a cross-sectional survey in Islamabad, Pakistan, Alam and his colleagues showed that women attending ANC clinics were more likely to recognize signs of a difficult pregnancy, to realize the importance of eating a healthy diet, and to indicate tetanus immunization uptake, compared to their non-attending counterparts (Alam et al., 2015).

There are some key nutrients necessary for a healthy pregnancy and lactating, these include

Calcium and the amount needed during pregnancy is 1,000 milligrams (mg) daily, and it helps build strong bones and teeth and main sources include milk, cheese, yogurt, etc, Iron (27 mg/day) which helps the red blood cells to deliver oxygen to the foetus and sources include lean red meat, dried beans, peas, and iron-fortified cereals, Vitamin A (770 micrograms daily) is required for healthy skin, eyesight, and bone growth of which food sources include carrots, dark, leafy greens, and sweet potatoes, Vitamin C (85 mg daily) which helps to promote healthy gums, teeth, and bones, and it also helps the body to absorb iron, the good sources of Vitamin C include citrus fruit, broccoli, tomatoes, and strawberries. Vitamin D (600 international units (IUs) daily) aids the body to absorption calcium, helps build bones and teeth and sources include exposure to sunlight, fortified milk, and fatty fish, such as salmon, Vitamin B6 (1.9 micrograms daily), helps form red blood cells and helps the body to use protein, fat, and carbohydrates with good sources include beef, liver, pork, whole-grain cereals, and bananas, Vitamin B12 (2.6 micrograms daily), this helps form red blood cells and maintains nervous system, and good sources include liver, meat, fish, poultry, and milk, and Folate (Folic Acid) 400 micrograms of folate daily minimum which helps in the production of blood and protein, it also reduces the risk of neural tube defects (a birth defect of the brain and spinal cord), and sources include green, leafy vegetables, liver, orange juice, legumes (beans, peas, lentils), and nuts.

However, weight gain is important during pregnancy. Women have distinct nutritional requirements throughout their life – especially before and during pregnancy and while in breastfeeding nutritional vulnerability is the greatest, and poor diets lacking of key nutrients – like iodine, iron, folate, calcium and zinc – can cause anaemia, pre-eclampsia, haemorrhage and death in mothers, and this can also lead to stillbirth, low birthweight, wasting and developmental delays for children. As United Nation Children's Fund (UNICEF) estimates that low birthweight affects more than 20 million newborns every year. (UNICEF, 2022)

Materials and Methods

Study Design

The study adapted was descriptive cross-sectional. The study was carried out in a snap short this was used to analyze data collected from the respondents. (Lavrakas, 2008)

Area of Study

Osun State, is a state in southwestern Nigeria is bounded to the east by Ekiti and Ondo states, to the north by Kwara State, to the south by Ogun State and to the west by Oyo State. Osun State is predominantly Yoruba comprises majorly Muslims and Christians, the State is populated with civil servant, traders, and farmers.

Study Population

The study involved pregnant women between the age of 20 to 45 year receiving antenatal care in secondary and tertiary health care system. However, data were collected from only those who agreed to be part of the study, while the respondents signed informed consent and assent forms. The target populations were the pregnant women visiting selected hospitals in three senatorial districts of Osun State between the ages of 20 – 45 years

Sample Size

A total Population of three hundred (300) participants were involved in the study which was determined using the WHO standard (WHO,2022).

$$N = \frac{Z^2 \times p(q)}{d^2}$$

where N is the minimum sample size to be determined, Z is the standard deviation, Z-score of 1.96 at 95% confidence level, p is the estimated proportion pregnant women attending of those who meet inclusion criteria, d is the degree level of accuracy 5% (0.05) and q is 1 – p. Considering a 10% nonresponse rate among respondents, the sample size was 300, to ensure the prevalence of the outcome variable falls within $\pm 5\%$ of the actual population coverage. For this study, 80% was assigned to P.

$$N = \frac{(1.96)^2 * 80(100-80)}{(0.05)^2} = 300$$

Sampling Technique

The selected hospitals were purposive selected for this study. The selected hospital were University of Osun Teaching Hospital, Osogbo and Obafemi Awolowo University Teaching Hospital Complex Ile-ife because they are government owned facilities where pregnant women receive free antenatal care, and large number of pregnant women are attending for services. The total number of pregnant women who have registered for antenatal care was taken and those woes met inclusion criteria was sorted out from the antenatal care register, and unique numbers was attached to those names written on a piece of paper, folded the papers, and placed them in a box for fair selection and also having equal chances of being selected

Data Collection

Structured questionnaire on socio economic characteristics such as educational level, monthly income, occupation of the respondents. Adolescent food habits checklist adapted from Johnson et. al. (2012) and a 24hour dietary recall and food frequency questionnaire from the Food and Agricultural Organization of the United Nations was used to collect food intake data, using a face-to-face interview procedure. We also used a set of questions to assess nutritional knowledge on dietary recommendations, source of nutrients, choosing everyday foods, and diet disease relationships. Assessment of Nutritional Status using Anthropometry parameters such as weight and height was also included.

Data processing and analysis

Data collected on socio-demographic characteristics and nutritional knowledge across the need for extra food, food groups, sources of nutrients, supplement nutrients, substances to be avoided during pregnancy, and actual dietary practices were adapted using SPSS version 26.0. Descriptive statistics such as frequencies, and percentage, mean and standard deviation (SD) were calculated.

Findings

Table 1 Socio demographic characteristics of the respondents

Variables	Categories	Frequency	Percentage (%)
Age	20-24	92	30.7
	25-29	85	28.3
	30-34	76	25.3
	35+	47	15.7
Education level of pregnant woman	Primary	45	15.0
	Secondary	103	34.3
	Tertiary	127	42.3
	Illiterate	25	8.3
Education of spouse	Primary	19	6.3
	Secondary	107	35.7
	Tertiary	166	55.3
	Illiterate	8	2.7
Marital level	Married	269	89.7
	Single	12	4.0
	Separate/Divorce	19	6.3
Pregnant women Income per thousand< 10		8	2.6
	11-25	110	36.6
	26-50	130	43.3
	51-100	20	6.6
	>100	32	10.6
Spouse Income per thousand	< 10	10	3.3
	11-25	90	30.0
	26-50	103	34.3
	51-100	45	15.0
	>100	52	17.3
Pregnant women occupation	Public/Civil servant	60	20.0
	Traders	46	15.3
	Farmers	12	4.0
	Full house wife	7	2.3
	Unskilled workers	175	58.3

Spouses' occupation	Public/Civil servant	105	35.0
	Traders	70	23.3
	Farmers	46	15.3
	Not working	5	1.7
	Unskilled workers	74	24.7

Table 2 Nutritional knowledge of pregnant women attending antenatal clinic

Statement	Yes	No	No idea
1.Pregnant women need to go for antenatal check-up	225(75%)	53(17.7%)	22(7.3%)
2. Protein intake necessary during pregnancy	246(82%)	39(13%)	15(5%)
3. Frequent intake of vegetable very Important during pregnancy period	177(59%)	91(30.3%)	32(10.7%)
4. Ffruit intake have effect on pregnancy outcome	252(84%)	19(6.3%)	29(9.7%)
5.Pregnant women need vitamin supplement and iron folic acid tablet during pregnancy	211(70.4%)	52(17.3%)	37(12.3%)
6.Knowledge about use of iodized salt for cooking	251(83.7%)	33(11%)	16(5.3%)
7.Knowledge about need of extra amount of food during pregnancy	214(71.3%)	49(16.3%)	37(12.4%)
8. Ssupplements good for pregnant women need during pregnancy.	211(70.4%)	52(17.3%)	37(12.3%)
9.Husband have encouraged you from attending antenatal clinic	289(96.3%)	11(3.7%)	-
10.Financial support from your husband	289(96.3%)	11(3.7%)	-
11. Attending antenatal clinic regularly	114(48%)	78(26%)	78(26%)

Table 3 Nutritional practices during Pregnancy

Statement	Agreed	Disagreed	Undecided
1.Early antenatal booking is good for my pregnancy	58(19.3%)	74(24.7%)	168(56%)
2.Skipping a main meal everyday will not affect pregnant woman's health	168(56%)	74(24.7%)	58(19.3%)
3. Believe that vitamin supplement and iron folic acid tablet is good for the foetus	67(22.3%)	185(61.7%)	48(16.0%)
4.It is good to drink 3-5 Litres of water daily during pregnancy	18(6%)	69(23%)	213(71%)
5.Eat 2-3 servings of fruits per day	9(3%)	25(8.3%)	266(88.7%)
6. it is good to taking tobacco during pregnancy	4(1.3%)	281(93.7%)	15(5%)
7.Avoid eating some foods	25(8.3)	275(91.7)	-
8. Intake alcohol during pregnancy	50(16.7)	250(83.3)	-
9. Observe superstition in your culture	65(21.7)	230(76.7)	5(1.6)
10 It good to be taking nut frequently	170(56.7)	20(6.6)	110(36.7)
11. You eat up 2-3 serving of vegetable/day	105(35)	195(65)	-
12. You eat 2-3 serving of meat/fish/day	213(71)	87(29)	-

Table 4 Test of Hypothesis

Hypothesis I: There is no relationship between dietary practices and nutrition status of pregnant women attending antenatal.

	Observed N	Expected N	Residual
Disagreed	58	100.0	-42.0
Undecided	74	100.0	-26.0
Agreed	168	100.0	68.0
Total	300		
Test Statistics			

Table 5: Dietary practices and Nutrition status of pregnant women attending antenatal

	dietary practices and nutrition status of pregnant women attending antenatal
Chi-Square	70.640 ^a
Df	2
Asymp. Sig.	.000

There is significant relationship between dietary practices and nutrition status of pregnant women attending antenatal clinic since the p-value is less than 0.05

Table 6 Test of Hypothesis II

Hypothesis II: There is no significant relationship between Practice and knowledge of pregnant women. visiting antenatal clinic.

	Observed N	Expected N	Residual
Yes	225	100.0	125.0
No	53	100.0	-47.0
No Idea	22	100.0	-78.0
Total	300		

Table 7: Relationship between attitude and knowledge of antenatal clinic visit of pregnant women

	relationship between attitude and knowledge of antenatal clinic visit of pregnant women
Chi-Square	239.180 ^a
Df	2
Asymp. Sig.	.000

There is significant relationship between attitude and knowledge of antenatal clinic visit of pregnant women because the p-value is <0.05.

Discussion of Findings

There are many factors such as age, educational level, income, and occupation that affect nutritional knowledge and practice among pregnant women positively most especially those who find antenatal attendance important during the period of pregnancy. The aforementioned is in line with Gezimu et. al (2022) which found maternal educational status, occupation, and parity has factors associated with nutritional knowledge.

The study revealed that many of the respondents agreed on the importance of attending antenatal clinic during pregnancy, this is similar to the study of Sangwan et. al (2022) that reported 51.1% attended antenatal clinic more than four times during the period of pregnancy, other studies reported higher attendance by the majority of the respondents in East Wollega, Ethiopia which is 64.4%, and in 2012 in Malaysia it was 70% (Daba et. al., 2013; Mitra et. al., 2012).

The study also revealed that the majority of the respondents were between age of 20-24 (30.7%), and 25-29 (28.3%) were aware of the antenatal program, and had a good level of education which implies their knowledge about antenatal, this helped the respondents to develop a good attitude and practice good nutrition and maternal health care this is in line with Arkkola et. al. (2006), found that education, occupation, and income affected the dietary intake in Finland. Also, a study conducted by Ongosi et. al. (2014) showed how marital status and age affect the dietary practices and nutrition status of pregnant mothers. The level of education of the respondent's spouse also shows a significant relationship with the dietary practice of their wives but a study carried out on rural pregnant adolescents showed poor nutrition status due to socioeconomic reasons such as illiteracy (Madhavi and Singh, 2011). In addition, Nutritional education for pregnant women during their ANC visit can also improve the nutritional knowledge during pregnancy. This is also in line with the results of the study on the percentage level of education of the respondent and that of the spouse with its influence on nutritional knowledge and practice as indicated by Tenaw and Tachbele (2018), Ikhsan et. al (2016), Leong et. al (2018), and Latifa (2012). The majority of the respondents agreed that their husbands encourage them to attend the antenatal clinic during pregnancy, and support them financially. More so, all the respondents agreed they were encouraged by the treatment given to them when attending antenatal.

As the result showed there was a knowledge gap in nutrition during pregnancy among pregnant mothers in Addis Ababa. Low nutritional knowledge was found to lead to poor dietary practices (AbuBaker, 2015). Nutrition knowledge is associated significantly with nutrition status (Zhao, Zhang and Li, 2011). Pregnant women with high nutrition knowledge had a high dietary diversity (Liao and Zhou, 2010). The findings also show that the majority of the respondents agreed that the community pregnant women's practice regarding the antenatal clinic.

The study found various assertions on the pregnant women's knowledge regarding the antenatal clinic, the majority of respondents agreed that pregnant women needed to go for an antenatal check-up, while the findings also indicated that the majority of respondents agreed that they were required to go for antenatal even if there was no complication during pregnancy. Also, 70.4% indicates that majority of the respondents agreed to pregnant women need a vitamin supplement and iron folic acid tablet during pregnancy, which is lower than the study conducted in Ethiopia at the district level (78.2, 68.5, 57.3, 62.9, 71.8% and 61.3%) (The Government of Federal Democratic Republic of Ethiopia, 2013). The difference is due to residence differences and giving attention to other milk substituting products since they have different options.

The study revealed that the majority of the respondents agreed that their husbands encourage them to attend an antenatal clinic during pregnancy, and support them financially.

The smoking of Tobacco and alcoholic intake during pregnancy is not good for better outcome. Marie and Nancy (1999).stated that Alcohol and tobacco use during pregnancy have both been associated with a number of adverse effects on the growth, cognitive development, and Prenatal tobacco exposure has been reported to be a significant risk factor for sudden infant death syndrome (SID) (Difranza and Lew, 1995).

Telake et.al (2021) found that the effects of maternal alcohol consumption during pregnancy on adverse fetal outcomes among Alcohol consumption during pregnancy may have adverse effects not only on the incidence of diseases, injuries, and other health conditions to the women but also on the infants and children teratogenic effect of fetal alcohol exposure may lead to actual and potential problems, instantly after birth, at infancy; or even later, and mental impairment in life, as well as Che (2012) who reported that Alcohol consumption during pregnancy may have adverse effects not only on the incidence of diseases, injuries, and other health conditions to the women but also on the infants and children.

The findings of the hypothesis one that showed that; dietary practices and nutrition status of pregnant women attending the antenatal clinic, The study found a positive significant relationship between dietary diversity and nutrient intake. Some studies have reported similar results such as Perumal et al. (2013) found a significant relationship between nutrition knowledge levels and dietary practices, and Arimond et al. (2010), noted the relationship between dietary diversity and micronutrient intake among poor rural women. Ann et al. (2013) found a relationship between the nutritional knowledge of pregnant adolescent girls with food intake, Bookari, & Williamson (2013) also revealed an association between nutrition knowledge with pregnancy performance. Good nutrition pivot optimum health, selection and combination of different food groups in adequate amount promote good outcome of pregnancy, and it is advisable and important for all pregnant women to get

information on the usual dietary intake of individual women before recommendations can be made about their need for specific nutrient supplements.

Conclusion

The importance of attending an antenatal clinic was found to be moderate with few having a positive attitude towards the antenatal clinic in the study area. The pregnant women should be enlightened on the effect of alcoholic intake and tobacco smoking on the pregnancy outcome but adequate intake of nutrient. Although the nutritional knowledge and practices of pregnant women in this study need improvement, a significant relationship exists between the variables used and dietary intake.

Recommendation

This study encourages authorities to take appropriate steps in the direction of creating awareness of the importance of nutrition before, during pregnancy, and after food fortification and supplementation to enhance the nutritive value of food by fortification, and implementing supplementation schemes. Targeted nutrition education programs should be developed, implemented, among the women of reproductive age. Government at all levels should implement nutrition education to improve nutrition knowledge and practices to increase dietary intake for better pregnancy outcome.

Acknowledgments

The authors appreciated Dada M.A and Ibrahim R.O for their contribution and devoting their valuable time on data collection of this study, and also all the pregnant women that participated in this study.

References

- Abdella A (2014). Maternal mortality trend in Ethiopia. *Ethiopian Journal of Health Development* 24(1).
- AbuBaker, H. (2015). Huda Abbas Mohammed Fadl 2015. Nutrition knowledge, attitude and dietary practices of adolescents and mothers of different socioeconomic backgrounds in Khartoum locality. *Ahfad Journal*, 32(1), 7172.
- Alam, A.Y, Qureshi, A.A, Adil M.M, and Ali, H. (2015). Comparative study of knowledge, attitude and practices among antenatal care facilities: Utilizing and non-utilizing women. *J Pak Med Assoc*, 55(2):53–56.
- Ann Coulston, Carol Boushey, Mario Ferruzzi (2012) *Nutrition in the Prevention and Treatment of Disease* 3rd Edition, ISBN: 9780123918857.
- Arimond, M., Wiesmann, D., Becquey, E., Carriquiry, A., Daniels, M. C., Deitchler, M., and Fanou- Fogny, N. (2010). Simple food group diversity indicators predict micronutrient adequacy of women’s diets in 5 diverse, resource-poor settings. *Journal of Nutrition*, 140(11), 2059S-2069S. doi:10.3945/jn.110.123414.
- Arkkola, T., Uusitalo, U., Pietikäinen, M., Metsälä, J., Kronberg-Kippilä, C., Erkkola, M., Veijola, R., Knip M., Virtanen S.M. and Ovaskainen, M.L. (2006). Dietary intake and use of dietary supplements in relation to demographic variables among pregnant Finnish women. *British Journal of Nutrition*, Volume 96, Issue 05, pp 913-920.
- Bhutta, Z.A, Chopra, M, Axelson, H., Berman, P., Boerma, T., Bryce, J., Bustreo F, Cavagnero, E., Cometto, G., Daelmans, B., De-Francisco, A., Fogstad, H., Gupta, N., Laski, L., Lawn, J., Maliqi, B., Mason, E., Pitt, C., Requejo, J., Starrs, A., Victora CG, and Wardlaw T (2014). Countdown to 2015-decade report (2000–10): taking stock of maternal, newborn, and child survival.
- Bookari, Khlood, Yeatman, Heather, Williamson, Moira J (2013) Exploring pregnant women's current level of nutrition knowledge, attitudes, and readiness for dietary change during pregnancy. Poster presented at the Australian College of Midwives 18th Biennial Conference, 30 September - 3 October 2013, Wrest Point, Tasmania.
- Cavagnero, E., Cometto, G., Daelmans, B., De-Francisco, A., Fogstad, H.,
- Cetin, I, and Laoreti, A. (2015). From the womb to the adult. In: Vassilios F, Michele M, Antonio DV, et al., eds. The importance of maternal nutrition for health. Proceedings of the 11th International Workshop on Neonatology and Satellite Meetings. Cagliari (Italy). *J Pediatr Neonat Individual Med*; 4:e040220.
- Chen J-HJA (2013) Maternal alcohol use during pregnancy, birth weight and early behavioral outcomes. *Alcohol*, 47(6):649–56.]
- Daba, G., Beyene, F., Fekadu, H., and Garoma, W. (2013). Assessment of Knowledge of Pregnant Mothers on Maternal Nutrition and Associated Factors in Guto Gida Woreda, East Wollega Zone, *Ethiopia. Journal of Nutrition and Food Sciences* 3(235).
- DiFranza J, and Lew R. (1995). Behavior of the exposed child (Effect of maternal cigarette smoking on pregnancy complications and sudden infant death syndrome. *Journal of Family Practice*. 40:385–394.).
- Federal Democratic Republic of Ethiopia (2016). National nutrition program, 2016-2020, 2016, pp. 1–83, <https://extranet.who.int/nutrition/gina/sites/default/filesstore/ETH%202016%20National%20Nutrition%20Programme%20II.pdf>
- Gezimu Wubishet, Firomsa Bekele and Getu Habte (2022) Pregnant mothers’ knowledge, attitude, practice and its predictors towards nutrition in public hospitals of Southern Ethiopia: A multicenter cross-sectional study *SAGE Open Medicine* Volume 10: 1–10 DOI: 10.1177/20503121221085843
- Ikhsan LN, Asifa N, Nasaruddin M, et al.(2017). Nutritional knowledge, attitude and practice among antenatal and postnatal mothers in hospital Tengku Ampuan Afzan (Htaa), Kuantan, Pahang 2016. *IJUM Med J Malays*; 17(1): 167–173.
- Johnson F1, J Wardle, J Griffith (2002). The Adolescent Food Habits Checklist: reliability and validity of a measure of healthy eating behaviour in adolescents *Eur J Clin Nutr* ;56(7):644-9. doi: 10.1038/sj.ejcn.1601371.
- .Latifa MF, Manal HA and Nihal SS (2012). Nutritional awareness of women during pregnancy. *J Am Sci*; 8(7): 494–502
- Leong Wong J, Zhe Xin L, Ying Lim P, et al. (2018). Knowledge of nutrition during pregnancy and associated factors among antenatal mothers. *Int J Public Heal Clin Sci*; 5(1): 2289–2577, <https://www.researchgate.net/publication/323941595>
- Liao, Y., and Zhou, J. (2010). Study on the knowledge, attitude and practice on nutrition among pregnant women in floating population. *Modern Preventive Medicine*, 37(1), 66-72.

- Madhavi, L.H., and Singh, H. K. G. (2011). Nutritional status of rural pregnant women. *Religion*, 2, 0-05.
- Marie D. Cornelius, and Nancy L. Day,(2000).The Effects of Tobacco Use During and After Pregnancy on children *Journal List Alcohol Res Health* v.24(4); 242–249
- Mitra, M, Wan, A, Manan, W, Affizal, A, and Mohd S. (2012). Dietary Knowledge and Behaviors in a Sample of Malay Pregnant Women; UMT 11th International Annual Symposium on Sustainability Science and Management 09th –11th July 2012, Terengganu, Malaysia.
- Ojofeitimi E. O., Ogunjuyigbe, P., Sanusi, R. A., Orji, A., Akinlo, A. A., Liasu, S. A. and Owolabi, O. O. (2018). Poor dietary intake of energy and retinol among pregnant women: implications for pregnancy outcome in Southwest, Nigeria. *Pakistan. Journal Nutrition* 7(3): 480-484.
- Ongosi, A., Gericke, G., Mbuthia, E. and Oelofse, E. (2014). Food variety, dietary diversity and perceived hunger among lactating women (0-6 months postpartum) in a low socio-economic area in Nairobi, Kenya. *African journal for food agriculture nutrition and development*. 14(2), 8663-8675
- Perumal, N., Cole, D. C., Ouédraogo, H. Z., Sindi, K., Loechl, C., Low, J. and Oyunga, M. (2013). Health and nutrition knowledge, attitudes and practices of pregnant women attending and not-attending ANC clinics in Western Kenya: a crosssectional analysis. *BMC pregnancy and childbirth*, 13(1), 146.
- Sangwan Pune Kiran S, Vikas D. Kshirsagar, Malangori A. Parande, Nandkumar M. Salunke*, Kinjal H. Solanki, Muralidhar P. Tambe, Dipali Pundkar (2022). Knowledge, attitude and practices regarding nutrition among pregnant females visiting the antenatal care outpatient department of a tertiary care hospital, *International Journal of Community Medicine and PublicHealth*[Vol9|Issue2;1-6,DOI:<https://dx.doi.org/10.18203/2394-6040.ijcmph20220064>
- Shekar, M, Heaver R, Lee, Y.K. (2016). Repositioning nutrition as central to development: A strategy for large scale action. World Bank Publications.
- Telake Azale, Yigzaw Kebede Gete & Mezgebu Yitayal (2021). Pregnant women attending antenatal care at public health facilities Gondar town, Northwest Ethiopia: a prospective cohort study Alemu Earsido Addila. *Substance Abuse Treatment, Prevention, and Policy* volume 16, Article number: 64
- Tenaw, Z., Arega, M. and Tachbele, E. (2018). Nutritional knowledge, attitude and practices among pregnant women who attend antenatal care at public hospitals of Addis Ababa, Ethiopia. *International Journal of Nursing and Midwifery*, 10(7): 81-89.
- Unicef (2022). Maternal nutrition Preventing malnutrition in pregnant and breastfeeding women. <https://www.unicef.org/nutrition/maternal>.
- WHO (2012). Nutrition. Available from: <http://www.who.int/features/factfiles/nutrition/facts/en/>
- Zhao Zhong, D.H., Liu, C.H.; and Su, S.P. (2010). Dietary analysis and nutrition status of pregnant women in China (in Chinese). *Today Nurse*, 4, 28–30.
- Lavrakas P.J (2008). Cross-sectional survey design *Encyclopedia of survey research methods*. Doi:<http://dx.doi.org/10.4135/978142963947.n120>