



Assessment of Zinc Deficiency and Nutritional Status among Pregnant Women from District Mardan, KP Pakistan

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ABSTRACT

Pregnancy-related zinc deficiency (ZD) has detrimental consequences on both the mother and the fetus, as well as subsequent implications on birth. It is estimated that 82% of all pregnant women in the world suffers from zinc deficiency. Lack of information on the zinc status of the population has significantly limited the adoption of strategies to control zinc. Assessment of the overall nutritional status, dietary intake and prevalence of zinc deficiency of pregnant women in District Mardan was measured. The study included 200 pregnant women from various hospitals of District Mardan. A pre-planned questionnaire was used to gather information. Statistical Package for Social Sciences (SPSS) was used to analyze the data. The mean age of the subjects was 35 years. Majority (65.5%) and (63%) had low hemoglobin and zinc level. Majority of the subjects were experiencing hair loss, changes in nails, diarrhea, nausea and vomiting. Exercise of daily basis was recorded for only (6.5%) of the subjects. Most (52.5%) of the subjects were having 1 to 3 hours of sleep. Zinc rich foods like Oat, egg yolk, kidney bean, Peanut, yogurt and chicken were consumed by majority of respondents. Food dense in macro and micronutrients should be consumed by respondents. Nutritional interventions should target pregnant women to improve maternal nutritional status to overcome maternal and fetus health issues.

INTRODUCTION

Pregnancy is characterized by a number of minor changes that aim to allow for the growth and development of the fetus, while preserving the mother's homeostasis and preparing for breastfeeding (Basdevant, 2016). An increase in dietary requirements, particularly those for energy, protein, vitamins and minerals (calcium, iron, sodium, magnesium, iodine, zinc, and fluorine), is linked to pregnancy. During pregnancy, there is an increased need to absorb all minerals (Shirman, 2018; Wayans, 2010). The malnutrition of pregnant women adversely affects both mother and fetus and is a major risk factor of complications such as anemia, high blood pressure, bleeding, miscarriage, growth problems, difficulty in giving birth, preterm birth, infant mortality and more frequent surgeries (Mufti, 2015; Peres, 2018). Pregnancy and its outcomes are significantly influenced by nutrients including

calcium, iron, sodium, magnesium, iodine, fluorine and zinc (Zeni, 2003).

Zinc (Zn) is a necessary mineral that is necessary for numerous body processes and is important for the development, synthesis, and manufacturing of antibodies. Additionally, zinc functions as an antioxidant and anti-inflammatory, maintaining the integrity of cells and organs. Zinc deficiency is one of the ten most influential factors in the burden of disease in developing countries (Khalid, 2014; Roshani, 2013), (Caulfield, 2004). Pregnancy-related zinc deficiency (ZD) has detrimental consequences on both the mother and the fetus, as well as subsequent implications on birth. Stunted growth, delayed immune development, mental retardation, impaired glucose tolerance, low birth weight, birth defects for a long time are all serious issues linked to zinc deficiency (Roshani, 2013; Sharpen tar,

2018). It is estimated that 82% of all pregnant women in the world suffers from zinc deficiency (Ma et al., 2004).

Maternal iron requirements are also higher than average absorbable iron intakes. If a woman's diet does not contain enough iron to meet these needs, the body can meet fetal requirements only by drawing upon maternal iron stores. The demands of the developing fetus may cause the mother to develop nutritional iron deficiency anemia. The World Health Organization indicates that, on average, 56% of pregnant women in developing countries is anemic (Allen, 2000)

Although ZD is becoming better identified as a problem, it is still unknown how severe ZD is in pregnant women (Shah, 2001(Karimi, 2003)). This lack of information on the zinc status of the population has significantly limited the adoption of strategies to control zinc deficiency (Wessel's and Brown, 2012) Pataki, 2003 Karmi, 2009 Arast, 2003. Many factors contribute to nutritional status of a pregnant woman, so socio-demographic, Anthropometric, clinical and dietary assessment of pregnant women of District Mardan was recorded with following objectives. Assessment of the overall nutritional status, dietary intake and prevalence of zinc deficiency of pregnant women in District Mardan.

MATERIAL AND METHODS

A community based cross sectional study was designed to evaluate the prevalence of zinc deficiency among pregnant women in District Mardan. The study was carried out in different hospitals of District Mardan. Convenient samples of 200 pregnant women were part of the study. A proper permission was taken from the Ethical Committee of Department of Human Nutrition and Dietetics Women University Mardan for carrying out the research work whereas a consent letter was signed from the participant regarding their willingness in the study. All the participant were informed about the purpose and outcome of the study.

A pre-planned questionnaire was developed for data collection of data regarding socio demographic characteristics, anthropometric parameters, bio chemical data, health status, physical activity and dietary intake and Food Frequency Questionnaire (FFQ) were used as data collection tools. Anthropometric information such as, weight and Body Mass Index (BMI) at the time of first visit to the clinic, gestational week and blood hemoglobin level, zinc level of the pregnant mothers were collected from the general questionnaire and MCH records. The study followed the standard of hemoglobin level below 11 g/dL during pregnancy as an indication of anemia. Consumption foods in FFQ were entered in household portions (table spoon, tea spoon and cups), converted into grams. Statistical analysis included descriptive statistics: percentage, mean and standard deviation (SD) and graphs based on frequency percentage. through SPSS (Statistical package for social

science version 16.0).

RESULTS AND DISCUSSION

The mean age of the subjects was 35 years with standard deviation of 4.8. Majority (65%) of the subjects were of age group (30-39). Some (24%) of the subjects had 1 to 3 children's. Majority (67.5%) of the subjects were educated, while 16% of the husbands were uneducated. Most (88%) of the subject were housewives. Majority (65%) of the husband were government servant. Nuclear family type was recorded for 86% of the subjects. Some (39%) of the subjects were living in rural area of district Mardan. Most (62.5%) if the subjects had average monthly income as shown in table 1. These findings of the study resembles to the work of Adikari, (2016) who assess the Nutritional status of pregnant women in rural areas of Sri Lanka. The study concluded that the mean age of the subjects was 32.7 ± 4.17 years. Majority (83.4%) were unemployed and housewife. In another similar study of Ali, (2014) who also assess the dietary diversity and its effect on nutritional status of pregnant women's. The study concluded that the mean age of pregnant women was 33.4 ± 4.2 years. Most (92.3%) of the women's were housewives. Tsegaye, (2020) also assess the dietary practices and Nutritional status of pregnant women in Ethiopia. The study concluded that the mean age of the subjects was 32.6 ± 4.3 year whereas most (84.1%) were housewives.

Anthropometric parameters of the subjects were recorded. The mean weight of the subjects was 82 kg with standard deviation of 5.3. The Mean height of the subjects was 159 (cm) with standard deviation of 18.4. The Mean Body Mass index of the subjects was 27.8 with standard deviation of 4.2. The Mean Waist and Hip Circumference was 88 (cm) and 104 (cm). The Mean waist to hip ratio was 0.8 with standard deviation of 0.05 as shown in Table no 2. Majority (44%) of the subjects were overweight followed by obese (31%) and normal (13%). As shown in Figure no 1. These outcomes resembles to the work of (Fakier,2017) who assess the association between the MUAC and body mass index among pregnant women looking forward for antenatal care in Metro west area of Cape town. The mean weight of the subjects was 79 kg whereas the mean height was 159 cm. Majority (32.9%) of the subjects were overweight followed by normal (32.3%). Another similar study by Mamighani, (2013) determined the waist circumference and pregnancy outcomes among women. The mean weight of the subjects 82 ± 9 whereas the mean height was 159.3 cm. The Mean body mass index was 26.5 ± 4.4 . Majority (44.6%) were overweight. Based on waist circumference the abdominal obesity was 34.8%. Snobbery, (2019) investigated the relationship between body mass index, Body image and sexual function among pregnant women's. The Mean body mass index of pregnant women was 27.74 ± 4.20 .

Table 1
Socio Demographic characteristic of the subjects

Variables	Categories	Frequency (N)	Percentage (%)
Age	20-29	56	28%
	30-39	130	65%
	Above 40	14	7%
No of children	1 to 3	48	24%
	4 to 6	80	40%
	More than 6	72	36%
Respondent education	Educated	135	67.5%
	Uneducated	65	32.5%
Husband education	Educated	168	84%
	Uneducated	32	16%
occupation	Housewife	176	88%
	Working lady	24	12%
Husband occupation	Government	130	65%
	Private	50	25%
	Labor	20	10%
Family type	Nuclear	172	86%
	Joint	28	14%
Residence	Rural	78	39%
	Urban	122	61%
Monthly income	Good	54	27%
	Average	125	62.5%
	Poor	21	10.5%

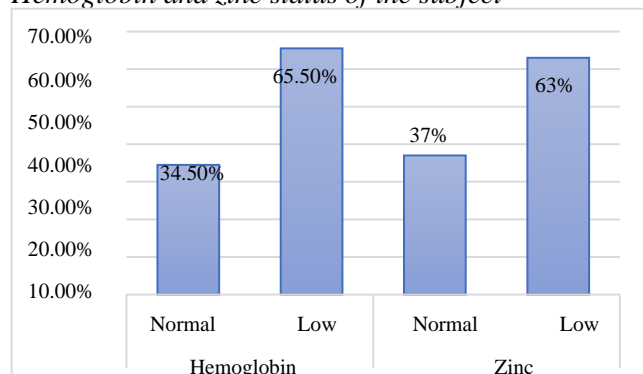
Table 2
Anthropometric Characteristics of the subjects

Variables	Means	Standard Deviation
Weight (kg)	82	5.3
Height (cm)	159	18.4
Body mass Index (kg/m ²)	27.6	4.2
Waist Circumference (cm)	88	6.9
Hip circumference (cm)	104	9.3
Waist to hip ratio	0.8	0.05

Table 3
Bio-chemical characteristics of the subjects

Variables	Means	Standard Deviation
Hemoglobin (g/dl)	10.9	2.7
Zinc (mcg)	68.2	2.8

Figure 1
Hemoglobin and zinc status of the subject



Bio chemical characteristics of the subjects was recorded through blood sampling. The mean hemoglobin level was 10.9 (g/dl) with standard deviation of 2.7. The mean Zinc level was 68.2 (mcg) with standard deviation of 2.8

as shown in table no 3. Figure no 1 shows the distribution of hemoglobin and zinc among the subjects. Majority (65.5%) and (63%) had low hemoglobin and zinc level. These outcomes of the study resemble to the work of Tanner, (2015) who identified the prevalence of anemia among 62% pregnant women. Suryanarayana, (2017) also determined the prevalence of anemia among pregnant women. The mean hemoglobin level was 10.3 whereas 62.3% were having anemia. Berheet, (2019) assessed the zinc deficiency among pregnant women and their children. The prevalence of zinc deficiency among pregnant women was 59% Table no 4. shows the clinical signs and symptoms of the subjects. Majority (64%) of the subjects were experiencing hair loss. Changes in nail were seen for 34% of the subjects. Onset of diarrhea was recorded for 70% of the subjects. Some (16%) of the subjects were not having any infection. Irritation and loss of appetite was recorded for 24% and 85% of the subjects. Subjects (83%) did not have any eyes problems. Subjects (14%) said that their wound takes long to recover. Some (9%) of the subject were not having loss of taste and smell.

Table 4
Clinical signs and symptoms of the subjects

Variables	Yes		No	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Hair loss	128	64%	72	36%
Changes in nails	68	34%	132	66%
Diarrhea	140	70%	60	30%
Infection	168	84%	32	16%
Irritation	48	24%	52	2%
Loss of appetite	170	85%	30	15%
Eyes problem	34	17%	166	83%
Wound takes long	28	14%	172	86%
Loss of taste and smell	182	91%	18	9%

Table no 5 shows the health status of the subjects. Majority (71%) of the subject were not having hypertension. Stress was seen among 23% of the subjects. Depression and diabetes was observed in (19%) and (13%) of the subjects. Majority (91%) of the subjects were not having any heart problem. Most (81%) of the subjects were having nausea and vomiting. These results of the study resembles to the work of (Zhang, 2018) who evaluated the prevalence rate of anxiety and depression as well as its associated factors among pregnant women. The study concluded that the prevalence of depression was 23% only. In another study of (Dukoet, 2019) who assess the prevalence of depression and its associated factor among pregnant women in Ethiopia. The results of the study concluded that the prevalence of depression was 21%. (Beyazit, 2018) also assess the effect of nausea

and vomiting on stress level of pregnant women's. Most (83%) of the pregnant women were having nausea and vomiting.

Table 5

Health status of the subjects

Variable	Response	Frequency (N)	Percentage (%)
Hypertension	Yes	58	29%
	No	142	71%
Stress	Yes	46	23%
	No	154	77%
Depression	Yes	38	19%
	No	162	81%
Diabetes	Yes	26	13%
	No	174	87%
Heart problem	Yes	18	9%
	No	182	91%
Nausea/Vomiting	Yes	162	81%
	No	38	19%

Table no 6 shows the physical activity of the subjects. Some (36%) of the subjects were not having exercise. Majority (33%) of the subjects had less than 30 minutes of exercise. Exercise of daily basis was recorded for only (6.5%) of the subjects. Only (7%) of the subjects had extreme intensity of physical activity. Most (52.5%) of the subjects were having 1 to 3 hours of sleep. Some (14.5%) of the subjects were using mobile and screen for more than 7 hours. These results resembles to the research work of Krzepot et al. (2018) that assess the effect of physical activity on quality of life among pregnant women. Some (32%) of the women's were not having any physical activity. Majority (42%) of them were having less than 30 minutes of exercise whereas 49.8% of them were having 1 to 3 hours of sleep, Harrison, (2018) also evaluated the attitude and barrier to physical activity among pregnant women's. The study concluded that some (28%) of the subjects were not having exercise. Table no 7 shows the consumption of zinc rich foods among the subjects. Sesame seed was consumed by only (18.5%) of the subjects. Some (34%) and (43%) of the subjects were consuming flax seed and pumpkin seed. Oat and Cocoa was consumed by 67.5% and 12% of the subjects. Cheese and egg yolk was consumed by 19.5% and 74.5% of the subjects. Consumption of beans and kidney bean was recorded for 38% and 69% of the subjects. Peanut, Lamb and almond was consumed by 63.5%, 11% and 44.5% of the subjects. Consumption of chickpea, peas, cashew, garlic and yogurt was recorded for 34.5%, 28%, 31.5%, 10.5% and 73% of the subjects. Brown rice, beef, chicken, mushroom and spinach was consumed by 49%, 21.5%, 63.5%, 18.5% and 29% of the subjects. These results are in line with the research work of Diana, (2018) that assesses the association between dietary quality and its diversity among pregnant women. The study concluded that sesame seed was consumed by only (18.2%) of the subjects. Some (36%) and (40%) of the subjects were consuming flax seed and pumpkin seed. Oat and Cocoa

was consumed by 69.6% and 17% of the subjects. Cheese and egg yolk was consumed by 21.6% and 73.2% of the subjects. Consumption of beans and kidney bean was recorded for 35% and 63% of the subjects. Peanut, Lamb and almond was consumed by 59.6%, 13% and 42.6% of the subjects. Consumption of chickpea, peas, cashew, garlic and yogurt was recorded for 35.7%, 26%, 33%, 13% and 77% of the subjects. Brown rice, beef, chicken, mushroom and spinach was consumed by 51%, 22%, 65%, 21% and 32% of the subjects.

Table 6

Physical activity of the subjects

Variables	Categories	Frequency (N)	Percentage (%)
Exercise	Yes	128	64%
	No	72	36%
Duration of exercise	Less than 30 minutes	66	33%
	30 to 60 minutes	45	22.5%
	More than 1 hour	17	8.5%
Frequency of exercise	1 to 3 days	78	39%
	4 to 6 days	37	18.5%
	Daily	13	6.5%
Intensity of exercise	Mild	74	37%
	Moderate	22	11%
	Severe	18	9%
	Extreme	14	7%
Sleep duration	1 to 3 hour	105	52.5%
	4 to 6 hours	58	29%
	More than 7 hours	37	18.5%
Screen time	1 to 3 hour	26	13%
	4 to 6 hours	145	72.5%
	More than 7 hours	29	14.5%

Table 7

Zinc rich food consumed by the subjects

Variables	Yes		No	
	Frequency (N)	Percentage (%)	Frequency (N)	Percentage (%)
Sesame seed	37	18.5%	163	81.5%
Flax seed	68	34%	132	66%
Pumpkin seed	86	43%	114	57%
Oat	135	67.5%	65	32.5%
Cocoa	24	12%	176	88%
Cheese	39	19.5%	161	80.5%
Egg yolk	149	74.5%	51	25.5%
Beans	76	38%	124	62%
Kidney beans	138	69%	162	81%
Peanuts	127	63.5%	73	36.5%
Lamb	22	11%	178	89%
Almond	89	44.5%	111	55.5%
Chickpea	69	34.5%	131	65.5%
Peas	56	28%	144	72%
Cashew	63	31.5%	137	68.5%
Garlic	21	10.5%	179	89.5%
Yogurt	146	73%	54	27%
Brown rice	98	49%	102	51%
Beef	43	21.5%	157	78.5%
Chicken	127	63.5%	73	36.5%

Mushroom	37	18.5%	163	81.5%
Spinach	58	29%	142	71%

CONCLUSION AND RECOMMENDATIONS

Majority of the subjects were educated, housewives and husband were government servant. Living in nuclear family type. had average monthly income. Majority had low hemoglobin and zinc level. hair loss, changes in nails appearance, Onset of diarrhea, loss of appetite, nausea and vomiting was experienced by most of respondents. Majority of the subjects had less than 30 minutes of exercise. Most of the subjects were having 1

to 3 hours of sleep. Oat and egg yolk, kidney bean, Peanut, yogurt chicken was consumed by the subjects. Keeping a healthy body weight is very important for both the mother and child birth. Intake of nutrient dense food including, iron, and zinc should be proper. Sleep duration should be kept between 7 to 8 hours. Community based session and seminars should be conducted to make awareness regarding importance of nutrition during pregnancy. Furthermore, studies should be conducted in other areas of the country to evaluate the prevalence of zinc deficiency before pregnancy and other micronutrients among pregnant women.

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