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Women Dietary diversity Score and cardiometabolic risk factors of female health workers of reproductive age in Saltillo Coahuila

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ABSTRACT

Introduction: Women's Dietary Diversity is a popular method for evaluating dietary diversity among women who are of reproductive age. It can also be helpful in identifying macronutrient deficiencies in women.

Objectives: This study was designed to determine the women dietary diversity score and the cardiometabolic risk factors of women in health in Saltillo Coahuila Mexico

Method: Across sectional study was carried out among one hundred and twenty-one randomly selected women working in the hospital. A prevalidated questionnaire was used to obtain information on socio demographic characteristics and lifestyle of the subjects. Food and Agriculture Organization pre validated structured questionnaire on women dietary diversity score (WDDS) was used. Anthropometric characteristics such as weight, height, waist circumference, waist to hip ratio and Mid upper Arm circumference (MUAC) were determined using World Health organization standard and used to classify obesity and cardiometabolic risk. Hypertension was determined using Sphygmomanometer. MDD-W was classified into two levels of consumption for women: low if MDD-W < 5 and high if MDD-W ≥ 5. The statistical analysis was performed using SPSS software ver.25 and results were reported in frequency distribution, mean ± standard deviation and pie chart. Pearson's correlation test was done to determine the significance of Dietary diversity with anthropometric indices and cardio metabolic risks.

Results: The majority (52%) of the subjects were single, forty-five (45%) percent smoke cigarettes while 83% consume alcohol. Seventeen percent had low MUAC, 51% had abdominal obesity and twenty nine percent had hypertension stage 11. Most (97%) had high WDDS. Identified cardiometabolic risk were smoking, abdominal obesity and obesity.

Conclusion: The women dietary diversity score of the subjects were high. The identified cardiometabolic risk factors among the participants were high. There is a critical and urgent need for nutrition and health education for the workers.

KEYWORDS

Eating habits, Female nutrition; Obesity, Hypertension, Metabolic health.

INTRODUCTION

Diets of Mexican women are gradually changing because of the influence of industrialization, societal advancement and shifts from the traditional diets to western diets**.** The process of dietary transition is rapid and the people's consumption levels of refined foods have increased because of this process, mostly because there are now more accessible foods and available fast foods, which has altered the traditional food patterns. Increased availability of goods and services has contributed to advancements in material well-being and has

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tremendously negatively impacted the nutritional status of women[1].

Low-quality, non-diverse diets are blamed for most of the world's disease and death, particularly for women and children in low- and middle-income countries (LMICs) who are vulnerable to malnutrition[2]. Meals that are monotonous and often consist of starchy staples with little to no fruits, vegetables, or animal products are prevalent in the diets of people[2]. The demanding conditions of health workers, who sometimes have restricted time owing to various employment offers and duty make them vulnerable to poor eating habits[3]. Prior to the Minimum Dietary Diversification for Women (MDD-W), the validated continuous measure known as the Women's Dietary Diversity Score (WDDS) was utilized. It is based on the reported intake of nine food groups.

The MDD-W is a common tool for assessing dietary diversity at the population level among women who are of reproductive age (15-49 years). It is a dichotomous indicator that is based on ten food groups[4]. The MDD-W indicator was created for situations in which it is not practical to use a weighed food record (WFR) or other quantitative dietary assessment techniques.

Women play significant roles in the health profession, family, the nation and globally. Women shoulder burdens of many responsibilities and may be prone to developing high blood pressure and have little or no time for quality dietary intake. They work in the health sector as well as indulge in household chores, raise children yet their significant contribution to economy has been underestimated and the nutritional status may be compromised. The health of women has been of a major growing concern across the world from past since many decades[5].

Anthropometric measurements are a set of quantitative measures used to evaluate the body's composition, specifically focusing on muscle, bone, and adipose tissue. The fundamental components of anthropometry consist of height, weight, arm, hip, and waist circumferences, as well as the ratio of the waist to hip. These measurements are significant because they serve as diagnostic criteria for obesity, which raises the risk for conditions like diabetes mellitus, hypertension, cardiovascular disease, and many others. These conditions increase the risk of morbidity and mortality and have an impact on the nation's economy by increasing the burden on state-funded and private expenditures as well as reducing years of productive life[6].

Malnutrition among women in health sector is likely to have a major impact on their nutritional status, productivity as well as their children's health. As women with poor

health statuses are more likely to bear low weight infants, cases of which are mostly noticed in underdeveloped and developing countries. To eradicate this problem, FAO proposed dietary diversity indicators for assessing and analyzing the nutritional situation and food consumption pattern of households, as promotion of diverse diets is considered as one of the several approaches to improve micronutrient deficiency in women of reproductive age[3]. There is paucity of thorough data from Saltillo Coahuila Mexico on women dietary diversity and health status as research on these group of people are often neglected. Therefore, this study is carried out to determine the Women Dietary diversity Score and Health Status of female health Workers of reproductive age in Saltillo Coahuila.

MATERIAL AND METHODS

Sample size

This study was carried out between January -July 2024 among the health workers in Universidad Autonoma Hospital Madero. One hundred and twenty-one women were randomly selected (121) for the study.

Ethical approval

The study was approved by the ethics committee of the Universidad Autonoma De Coahuila under the broad project conducted in the University. After explaining the purpose, methodology and benefits of the study, participants provided their respective informed consent.

This cross-sectional study was carried out among one hundred and twenty-one randomly selected health workers in Universidad Autonoma Hospital Madero. Data obtained were socio demographic characteristics. A validated structured questionnaires in Spanish language were used to solicit information on the sex, age, income, habitation and religion etc.

Food and Agriculture Organization (FAO) Questionnaires on Women Dietary Diversity translated to Spanish language with little modification according to the Mexicans situation was used[6]. Data on dietary diversity were collected using both quantified and unquantified 24-h open recall, which is a validated approach for obtaining the necessary information on dietary diversity for calculating dietary adequacy and intake[7,8]. The last day and night, the participants were instructed to make a list of every food they had eaten, whether it was from their family or not. The interviewer used the open recall to check off every food category the participant mentioned on a predetermined list, and if a group wasn't mentioned, the interviewer inquired as to whether any food from that group had been ingested. Each food group consumed was counted only once, regardless of the frequency of consumption. It should be noted that the women's dietary diversity was calculated using a single 24-hour recall. All foods consumed by the women

were classified into ten distinct food groups according to the MDD-W[9] (1) starchy staples (grains, with roots and tubers, and plantains); (2) meat, poultry, and fish; (3) dark green leafy vegetables (Purslane, spinach, lettuce, parsley); (4) other vitamin A-rich fruits and vegetables; (5) other vegetables (Zucchini, stewed tomato, raw tomato, chili,squash flower, chayote, nopal); (6) other fruits; (7) pulses (beans and lentils); (8) dairy; (9) eggs; and (10) nuts and seeds. According to the Food and Agriculture Organization of the United Nations (FAO) guide[9], plant sources of vitamin A include dark green leafy vegetables, vitamin A-rich vegetables and roots, vitamin A-rich fruits and red palms, while animal sources include offal, eggs, milk and milk derivatives. Iron-rich foods include offal, meat and fish. For each woman, a minimum of 0 and a maximum of 10 points can be obtained. Higher scores indicate greater diversity, as more food groups were reported as being consumed. To achieve minimum dietary diversity, respondents must eat foods from at least five of the ten food groups.

The blood pressure was taken in accordance with the American Society of Hypertension's office blood pressure measuring guidelines with little modifications. The participants had to take a seat and rest for longer than thirty minutes. Prior to the assessment, patients were instructed to abstain from coffee, exercise, and smoking for at least thirty minutes. It was made sure that the participants' bladders were empty. The time of the blood pressure measurement was silent. After that, a digital sphygmomanometer was used to measure the blood pressure in each arm in turn, using the higher reading. A total of three measurements were made, two of which were made at intervals of two minutes. The participant's blood pressure was then determined by averaging these three results. It should be highlighted that regardless of their relevant blood pressure, people receiving medical therapy for HTN were classified as hypertensive. Anthropometric indices were measured using guidelines that were comparable to those for family physician assistant training. Using a Jawon medical body composition analyzer (x-contact 350), the distribution of fat was measured. According to the authors, a blood pressure measurement of 140 mm Hg or above at the systolic or 90 mm Hg at the diastolic level indicates the onset of hypertension[10]. A systolic blood pressure of 160 mm Hg or higher, or a diastolic pressure of 100 mm Hg or higher, was indicative of stage II HTN[10].

When standing and without shoes, height was measured to the nearest half centimeter, and weight was measured to the nearest 0.1 kg when wearing light clothing. The Body Mass Index was classified based on weight over height in metre square. BMI grades were used to describe anthropometric status. Less than 18.5 kg/m^2 was considered underweight; 18.5 kg/m^2 to 24.9 kg/m^2 was considered normal; 25 kg/m^2 to 29.9 kg/m^{2}was considered overweight; 30 kg/m^2 to 34.9 kg/m^2 was considered grade I obesity; 35 kg/m^2 to 39.9 kg/m^2 was considered grade II obesity; and more than 40 kg/m^2 was considered grade III or morbid obesity[11].

Using a tape measure with a half-centimeter accuracy, the Waist circumference (WC) was determined as the midpoint point between the top border of the iliac crest and the lower border of the lower ribs, and the height circumference (HC) was determined as the centimeter-widest part of the buttocks. WHR was calculated as the WC/HC ratio (in centimeters). The classification of the subjects based on WHR was < 0.80 (normal), 0.80 to 0.84 (overweight), and ≥ 0.85 (obese) for females[12]. The subjects were classified as with obesity or without obesity. Here, in accordance with a report from a WHO expert consultation, we divided WHR into two groups: normal and obese. In women, waist circumference > 80 cm and waist to hip ratio > 0. 85 were considered as increased and markers of abdominal obesity[12].

Mid upper Arm Circumference (MUAC)

Using a non-stretched measuring tape and a relaxed right or left arm, the MUAC was measured. The tape was placed halfway between the tip of the acromion and the olecranon. To prevent soft tissue compression, the tape was wrapped tightly but softly around the arm. The value less than 23 cm was classified low while greater than 23cm was normal according to World Health Organization standards[12].

Data processing and statistical analysis

The statistical analysis was performed using SPSS software ver.25. MDD-W was classified into two levels of consumption for women: low if MDD-W < 5 and high if MDD-W ≥ 5. Data were described in frequency distribution, mean ± standard deviation and the results were presented pie chart and tables. Pearson's correlation test was done to determine the significance (at the upper 5% level) of Dietary diversity with anthropometric indices and cardio metabolic risks. The analysis concentrated on the various dietary groups that the women ate. A score of 1 or 0 was assigned to each food or food group based on whether it was consumed.

RESULTS

Socio demographic characteristics of the Respondents

Figure1 presents the socio demographic characteristics of the respondents. The majority (52%) of the subjects were single, thirty two percent (32%) were married, 8.5% were divorced, 1.7% were separated while 3.3% were widowed. Greater percentage (84%) lives with family members in the household while 9.5% lives alone, Higher percentage (85%) were catholic, 10% were Christians, 2.5% were Atheist while 2.5% remained anonymous.

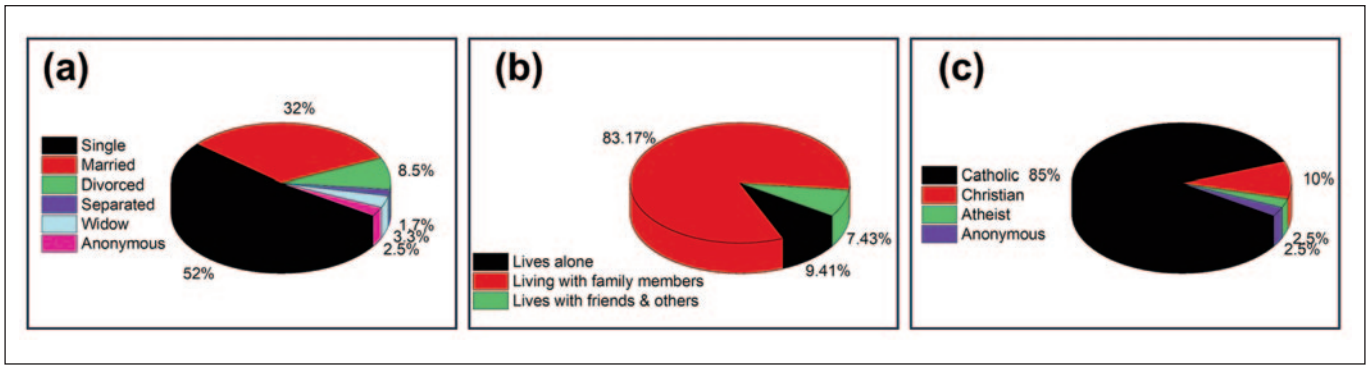

Figure 1. Sociodemographic characteristics of the respondents (a) marital status (b) habitation (c) religion

Figure 2 shows the socio-economic characteristics and habits of the respondents. About seven percent (7.2%) earn Less than or equal to $12680, twenty two percent (22%) earn $12680- $20583, seventy percent (17%) earn $20583-26658, 27% earn $26658-32958, and 0.8% earn $69136-90129. Forty-five (45%) percent smoke cigarettes while 83% consume alcohol

Table1 presents the frequency of consumption of food groups by the respondents. The most consumed food groups were Dark green leafy vegetables (76.03%), seventy five percent (75.21%) consumed eggs, 74.38% consumed other vitamin A-rich fruits and vegetables while the least consumed were other vegetables (57.02%).

Table 2 reflects the mean anthropometric indices and blood pressures of the subjects. These were weight (69.68±15.77), height (1.59±0.07), Waist to Hip Ratio (0.86 ±0.02), Body Mass Index (27.37±6.06), Mid upper Arm Circumference (28.82±15.05), Waist Circumference (88±16.32), Hip Circumference (103.91±15.84). The diastolic pressure (75.84± 12.20) and Systolic pressure (112.08±16.16).

Anthropometric characteristics and WDDS classification of the respondents are presented in Table 3. Three percent (3.31%) of respondents were underweight, thirty six percent (36.36%) had normal weight, thirty percent (30.58%) were

Table 1. Frequency of consumption of food groups by the respondents

Food Groups Scores	Frequency	Percentage
Dark green leafy vegetables	92	76.03
Eggs	91	75.21
Other vitamin A-rich fruits and vegetables	90	74.38
Other Fruits	88	72.73
Meats, poultry and fish	88	72.73
Starchy staples	84	69.42
Nuts and seeds.	84	69.42
Pulses	73	60.33
Dairy	86	71.07
Other vegetables	69	57.02

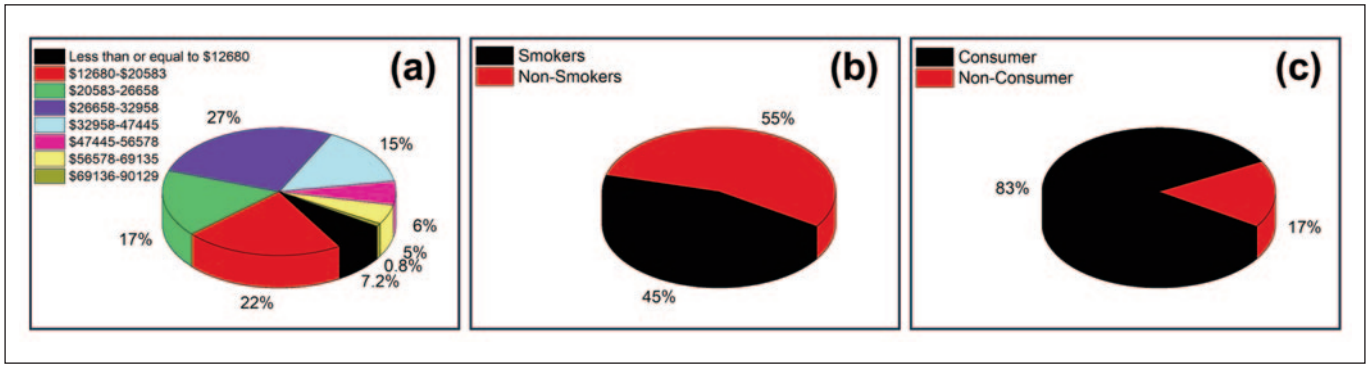

Figure 2. Socio economic characteristics and habits of the respondents: (a) Income (b) Cigarettes smoking (c) Alcohol consumption

Table 2. Mean Anthropometric indices and blood pressure of the respondents of the subjects

Parameter	Mean and standard deviation
Weight	69.68±15.77
Height	1.59±0.07
Waist to Hip Ratio	0.86 ±0.02
Body Mass Index	27.37±6.06
Mid upper Arm Circumference	28.82±15.05
Waist Circumference	88±16.32
Hip Circumference	103.91±15.84
Diastolic	75.84±12.20
Systolic	112.08±16.16

Table 3. Anthropometric characteristics of the respondents

Parameter	Frequency	Percentage
Body Mass Index		
Underweight	4	3.31
Normal Weight	44	36.36
Overweight	37	30.58
Obesity grade 1	24	19.83
Obesity grade 2	12	9.92
Total	**121**	**100**
MUAC		
Low	26	21.49
Normal	95	78.51
Total	**121**	**100**
Waist Circumference		
Normal	29	23.97
Obese	92	76.03
Total	**121**	**100**
Waist to Hip Ratio		
Normal	36	29.75
Overweight	23	19.01
Abdominal Obesity	62	51.24
Total	**121**	**100**

overweight, nineteen percent (19.83%) had obesity grade 1 and nine percent had obesity grade 11. Twenty-one (21.49%) percent had low MUAC, seventy six percent (76.03%) were obese according to waist circumference while waist to hip ratio indicated that nineteen percent (19.01%) were overweight, while fifty one percent (51.24%) had abdominal obesity.

The Table 4 shows the hypertension status and women dietary diversity scores of the respondents. Based on systolic blood pressure, 19.83% had hypertension stage 1, 28.93% had hypertension stage 11, while 7.44% had diastolic hypertension stage 1, and 1.65% had diastolic hypertension stage 11. Majority (96.70%) had high WDDS

Correlations between anthropometric characteristics, food groups and women dietary diversity of the respondents are presented in Table 5. There is a significant relationship between MUAC and dark green vegetables ($p< 0.05$), waist circumference and dark green vegetables ($p<0.05$), hip circumference and eggs ($p< 0.05$), waist to hip ratio and pulses ($p<0.01$). There is significant relationship between income and dark green leafy vegetables, eggs, other vitamin A-rich fruits and vegetables, nuts and seeds, meats, poultry and fish and starchy staples ($p<0.05$), while inverse correlations exist between diastolic and other green vegetables, diastolic and starchy staples.

Table 4. The Hypertension status and WDDS classification of the respondents

Systolic Blood Pressure		
Normal	52	42.98
High Normal	10	8.26
Hypertension stage 1	24	
Hypertension stage 11	35	28.93
Total	**121**	**100**
Diastolic Pressure		
Normal	104	85.95
High Normal	6	4.96
Hypertension stage 1	9	7.44
Hypertension stage 11	2	1.65
Total	**121**	**100**
WDDS		
Low	4	3.30
High	117	96.70

Table 5. Correlations between anthropometric characteristics food groups of the respondents

VARIABLES	DGV	Eggs	OVARV	NS	MPF	PS	DA	OV	OF	SS
Diastolic	-0.22*	-0.10	0.04	-0.14	-0.02	0.06	0.10	-0.02	0.19	-0.16*
BMI	0.13	0.01	-0.03	0.09	-0.02	-0.08	-0.03	0.12	0.20	0.01
WHR	0.17	0.06	0.14	-0.12	0.04	0.25**	0.09	-0.04	0.10	0.14
WDDS	0.03	-0.13	0.05	0.04	-0.04	-0.15	-0.09	-0.03	-0.12	-0.13
Weight	0.12	0.04	0.03	0.08	-0.09	0.06	0.01	0.01	0.35	0.67
Height	0.06	0.04	0.03	-0.02	0.03	0.05	0.10	-0.11	0.03	0.05
MUAC	0.21*	0.08	0.10	0.13	0.04	0.01	0.09	0.08	0.07	0.01
Waist	0.22*	0.06	0.07	0.05	-0.03	0.07	-0.02	0.04	0.06	0.14
Hip	0.06	0.11*	0.01	0.11	-0.03	0.03	0.13	0.09	0.19	0.12
Systolic	-0.15	-0.01	0.10	-0.14	-0.06	-0.01	0.05	-0.09	0.93	-0.15
Income	0.01	0.02	0.03	0.04	0.05	0.01	0.05	0.08	0.25	0.01

P value is significant at $p<0.05$.
Key: DGV: Dark green leafy vegetables; OVARV: Other vitamin A-rich fruits and vegetables; NS: Nuts and seeds; MPF: Meats, poultry and fish; PS: Pulses; DA :Dairy; OV: Other vegetables; OF: Other Fruits; SS: Starchy staples , Waist: Waist circumference; Hip: circumference.

DISCUSSION

Socio demographic characteristics of the Respondents

This study was conducted among the workers in the health sector in Saltillo. The socio demographic characteristics of the respondents revealed that most of the subjects were single, few were divorced, separated and widowed. This observation could have a significant impact on food consumption, as marriage has been shown to have impacts on the food consumption of family[13]. According to research conducted in Nepal, the Netherlands, Bangladesh, Ghana, and Ethiopia, women who have the authority to choose what to buy for their household are 3.93 times more likely to consume a sufficient variety of foods. Higher percentage of the study group were catholic, this observation could influence the dietary pattern and choices as rreligion has been observed to be among significant sociocultural factor influencing food habits and dietary choices. Religious beliefs often dictate certain diet restrictions, fasts, feasts, and specific food preparation methods[14].The study revealed that income has a positive significant correlation within food groups ($p<0.05$). It could be deduced that the subjects have higher dietary diversity due to the availability of money to be spent on foods. Contrary to our expectation, forty-five percent of the participants smoke cigarettes, and eighty three percent consume alcohol. Cigarette smoking may impact fracture risk in women. Smokers may have lower body weights, which may result in less estrogen being produced, less cushioning during falls, and less physical stress of the weight-bearing bones (which would reduce the growth stimulation)[15]. Women's bone health may be impacted by the "antiestrogenic" effects of cigarette smoking, even when body weight has been considered. Smokers may have reduced levels of 1,25-dihydroxyvitamin D, parathyroid hormone, and 25-hydroxyvitamin D, all of which may indicate a higher rate of bone resorption[12]. Cigarette smoking appears to result in decreased calcium absorption or retention in the stomach, possibly because of these hormonal features[16].

Additionally, smoking most likely raises cortisol levels over time in a minor way, which may have an impact on bone. There have also been suggestions of direct effects of nicotine on osteoblasts[15]. Alcoholism is linked to a higher incidence of osteoporosis and fractures[15]. Consumption of alcohol has been linked to higher quantities of estrone sulfate which often results in hormone disorder[17]. Furthermore, alcohol has been revealed to increase blood pressure and lead to metabolic changes that are associated with inflammation and obesity[17].

The respondents' frequency of consumption of several food groups showed that dark green leafy vegetables were consumed most frequently (76.03%), followed by eggs (75.21%), other vitamin A-rich fruits and vegetables (74.38%) and vegetables (57.02%). This result obtained might be due to the period in which this study is conducted.

The anthropometric characteristics of the respondents revealed that three percent (3.31%) of respondents were underweight, this could be due to other underlining factors that were considered in this study. However, overweight and obesity is a critical issue observed in this study as more than half of the subjects were either overweight or obese. This confirms the report of other researchers that overweight and obesity is one of the public health issues in Mexico[18]. This could be attributed to their employment status as obesity rates are much greater in cities with correlation between maternal employment status and obesity[19].

In this study we discovered that the waist circumference and waist to hip ratio of the participants is very high. WHR is a rapid, affordable, and precise method for figuring out a patient's level of obesity. It may also be a sign of a patient's vulnerability to cardiometabolic problems[20]. Studies have shown that WHR can predict the chances of heart disease or even early death[20]. WHR is a more reliable indicator than BMI. When evaluating disease risk, the waist circumference is a gauge of visceral adiposity and can be used in addition to BMI, visceral fat, or extra body fat inside the abdomen, linked to a higher risk of disease than other types of fat[20]. Even in the absence of a rise in BMI, abdominal fatness is a risk factor on its own that predicts co-morbidities and death[20]. A high BMI alerts the healthcare provider that a patient is carrying too much body fat, whereas a high waist circumference suggests that a significant amount of the extra fat is visceral fat. A waist circumference of more than 35 inches (88 cm) for women and more than 40 inches (102 cm) for males is deemed high risk[20]. According to our findings, it was discovered that based on systolic blood pressure, 19.83% had hypertension stage 1, 28.93% had hypertension stage 11, while 7.44% had diastolic hypertension stage 1, and 1.65% had diastolic hypertension stage 11. This finding confirms the result of waist circumference and WHR that are high among the subjects. This is conformity with the report of McDonnold et al[20], abdominal fatness is a risk factor on its own that predicts cardiovascular diseases and death.

Most of the participants in the study (96.70%) had high WDDS. These results are consistent with those of studies carried out in Ethiopia and Zambia, which also found high WDDS scores, but slightly lower than ours [21]. Geographical disparities and study groups may be the reason for the discrepancies. It is greater than the results of other studies conducted in Bangladesh (65%; Algeria (32%); India (46.2% to 76.6%; South Africa (25%) and Algeria (46.2% to 76.6%)[22-24]. The group of participants studied, and the period of the investigation may have contributed to the high proportion of adequate dietary diversity in this study.

Our study showed correlations between anthropometric characteristics, food groups and women dietary diversity of the respondents. There is a significant relationship between MUAC and dark green vegetables ($p< 0.05$), waist circumference and dark green vegetables ($p<0.05$), hip circumference and eggs ($p< 0.05$), waist to hip ratio and pulses ($p<0.01$). There is significant relationship between income and dark green leafy vegetables, eggs, other vitamin A-rich fruits and vegetables, nuts and seeds, meats, poultry and fish and starchy staples ($p<0.05$), while inverse correlations exist between diastolic and other green vegetables, diastolic and starchy staples.

To the best of our knowledge, this is the first study on WDDS in Coahuila, a northern region of Mexico, which is one of its advantages. Additionally, there is a paucity of research on the state health workers and cardiometabolic status. However, the study also had certain shortcomings. First, responses are based on 24 hours dietary recall and the questionnaires used, data may be subject to both recall bias and social desirability. Also, the number of participants used may not be a general representation of the women in the state but a good representation of women in health sector in the state according to the state statistics. Lastly seasonal variation may influence dietary diversity.

CONCLUSION

The women dietary diversity score of the subjects were high. The identified cardiometabolic risk factors among the participants were high. There is a critical and urgent need for nutrition and health education for the workers. The participants must adjust their lifestyle and anthropometric indices to maintain a good health status. The information may provide data base for intervention in the study group.

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