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Impact of Seasonal Variations on Female Anthropometric Measurements

Tawfeg A. Elhisadi[1] , Salwa Muftah Eljamay[2*]

[1] Associate Professor, Department of Public Health, College of Medical Technology, Derna, Libya
[2] Assistant Professor, Department of Public Health, College of Medical Technology, Derna, Libya

[*]*Corresponding author: salwaeljamay@cmtd.edu.ly*

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Abstract:
Seasonal effects on food intake have been described in resource-poor settings with high rates of malnutrition in various parts of Africa and South Asia. **The aim of the study** was to assess the anthropometric measurements change on female during seasonal variation in food intake. **Material & Methods:** Data from 1050 females participants aged 15 - 65 were used for this investigation. Study participants were seen during consecutive four seasons in October (autumn), January (winter), April (spring) and July (summer). Anthropometric measurements were taken by In Body 320. **Result:** body composition the percent of Body Mass Index (Kg\ m2) during the year seasons, that the highest percent for 31 – 40 kg\m2 (48.7%), followed by 21 – 30 kg\m2 (28.2 %). The mean high value of height, weight, Body Mass Index, waist Circumference, Veeral fat, and Fat Mass was seen highest in winter season while the percentage of Fat Free Mass was lower, as result of the increased in fat percentage during winter season when compared with another season. Muscle strength in winter is the lowest percent (22.13 %), followed by spring (22.75 %), muscle strength in autumn is the highest percent (25.3 %), followed by summer (23.73 %), The correlation is significant at the 0.05 level (P-Value) of Age and Anthropometric measurements that the P-Value < 0.005. **Conclusion:** The mean high value of height, weight, body mass index, waist Circumference, Veeral fat, and Fat Mass was seen highest in winter season while the percentage of Fat Free Mass was lower, as result of the increased in fat percentage during winter season when compared with other season, no significant variations were reported in this study.

Keywords: Fat Free Mass, Fat Mass, Seasons, Body Mass Index, Waist Circumference

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Introduction

Seasonality in diet in these settings is primarily due to staple cereal harvest periods and depletion of food stocks between harvests. The work of cultivating crops can make an impact on nutritional status by altering energy expenditure[1], household food security is affected by the seasonality of food access as well as by the seasonality of dietary habits, including relying on ready-to-eat foods purchased outside the home, and by some livelihood characteristics of households [2],

the seasonal changes in physical performance of youth female soccer players, while controlling for both baseline performance and change in maturity status [3], Food consumption and biochemical parameters showed significant seasonal variations in older adults. It is not clear if nutrition plans in older adults will benefit from consideration of seasonal changes in eating habits[4], energy and nutrient intake and blood levels varied across seasons in older adults.[4], seasonal variations have significant effect on the nutritional status, body weights and compositions, daily energy expenditures, and particular serum vitamin levels in individuals.[5], clinical reasoning and support the design and direction of future larger-scale primary studies examining lower-limb injury prevention in Spanish elite male and female youth soccer players.[6], the seasonal variations in the effects of no shivering thermogenesis on metabolic rate and substrate metabolism suggest a buffering of energy expenditure and an increased use of glucose as fuel by BAT as a result of acclimatization too cold in the winter.[7], body composition characteristics improved over the season, which reveals that nutritional habits were controlled and, consequently, the intensity of training and matches did not affect the body composition variables.[8], months of judo training and/or growth/maturation contributed to significant changes in anthropometry, body composition, and physical fitness, particularly in young male judo athletes.[9]. household food insecurity access scale (HFIAS), was a better predictor of nutritional status of mothers and children in both the food surplus and lean seasons, while HDDS was a better predictor of maternal and child nutritional status post-harvest.[10], numerous components of maternal nutrition show seasonality in lowland Nepal, and this pattern extends to newborn size. Seasonality should therefore be accounted for when Seasonality and nutrition in Nepal[11], Athletes who could improve their jump coordination performance more during the 32-weeks-season were at a significant lower risk for sustaining an injury.[12], important to monitor and record the changing trend of physical traits, especially those who follow the poor lifestyle.[13]. The seasonal variations have a significant effect on nutritional status, body weights and compositions, daily energy expenditures, and particular serum vitamin levels in individuals.[14] , Food consumption and biochemical parameters showed significant seasonal variations in older adults.[15], the rural community is food insecure, on a higher level during summer and autumn, which leads to the consumption of undiversified diets. The women are malnourished and obese with a risk of metabolic syndrome. [16]. in early autumn and at reduced rates during midwinter and midsummer. Seasonal food consumption patterns may be related to basal metabolic activity, [17].

Material and methods

Study layout and participants:

The study was conducted during consecutive four seasons in October (autumn), January (winter), April (spring) and July (summer). The participants female aged 15 – 65 years old included in this study, studying in the department of outpatient department (OPD) in Wahda hospital, and four private clinics. One thousand and fifty female volunteers were involved in the study; the data were collect from October, to July 2021, according to the season start in Libya.

Sample collection

Individual anthropometric measurements (body weight, height, waist circumference) were taken, and body components, fat mass (FM), fat-free mass (FFM), and visceral fat (VF)) were measured by the In Body 230 used in this study to measure body composition through a method called bioelectrical impedance (BIA), to perform the analysis each time under the same condition, temperature, posture, etc.). BIA is painless, quick, non-invasive, and does not pose any risk of side effects. Body measurements are done at least three hours after eating or exercising. Volunteers were weighed without shoes and removed any heavy objects such as jewellery, phones, belts, jackets, or wallets before stepping onto the in-body scale, to improve their bodies' conductivity. Volunteers stood upright for at least five minutes before In Body measurements; this helped body fluid be evenly distributed.

Age, height, and gender were entered into the machine, the handhold sensors on either side of the machine, with arms outstretched at about waist level with thumbs on the sensor.

Body Scale has completed its reading and provided a detailed printout explaining your unique body composition.

Statistical analysis:

The data analyzed by SPSS (Statistical Package for the Social Sciences) version 26, Categorical variables were described as frequency rates and percentages, Mean , S.D and continuous variables were described using mean and Pearson Correlation (R), Correlation and , P-Value.

Results and discussion

The season variation in anthropometric measurements and body composition the percent of BMI (Kg\ m2) during the year seasons the figure (1) illustrated that the highest percent for 31 – 40 kg\m2 (48.7%), followed by 21 – 30 kg\m2 (28.2 %). The mean high value of height, weight, BMI, WC, VF, and FM was seen highest in winter season while the percentage of FFM was lower, as result of the increased in fat percentage during winter season when compared with other season, no significant variations were reported in this study, between seasons $p>0.05$. This results revealed that cold weather, increase appetite leads to over consumption of foods, and spend more time in sleep with less physical activity was characterized more weight gain than other season. The study found that the loss weight observed in summer when compared with other season, in summer the participants feel better, the value of energy expenditure due to high physical activity increased in summer, less food consumption and short time spent in sleep compared to autumn, spring and winter. The study observed that decreased of participants' visitors to nutritionist during summer months was 9.52%, when compared with spring, winter, and autumn, represented 44.1%, 33.9%, and 12.3% respectively, because positive behaviors feeling of lost weight are observe more often in summer months compared with other seasons. In summer-increased consumption of fruits, vegetables and drank a lot of water and juices, instead of high-energy foods consumed such as fats, carbohydrate, due to a lack of appetite, and not getting large calories. The study reported that high calorie food were lower in summer season when compared with others. The study observed muscles strength increased in autumn than winter, when muscles are cold, exercise performance may be impaired compared to when muscles are warm, autumn is pre-winter season, which spent increasing intensity of muscles strength to reach physical peak. Muscles strength starts in the summer to reach highest peak in autumn and decreased during winter as illustrated in figure (2). Seasonal variation in body muscle strength is shown in Figure 3, That muscle strength in winter is the lowest percent (22.13 %), followed by spring (22.75 %), muscle strength in autumn is the highest percent (25.3 %), followed by summer (23.73 %), The correlation is significant at the 0.05 level (P-Value).of Age and Anthropometric measurements that the P-Value < 0.005, shown in table 2, The relationship between age and BMI figure 4 illustrated that the ages between 25 – 50 years have high BMI 31 – 40 (kg\m2). Most of the previous studies talked about the effect of weather on health, spatially in pregnant [14]. In other study told that the effect of seasonality across the distribution of birth size could be important to identify vulnerable subgroups and develop better, targeted interventions to improve maternal and child nutrition and health. [15], in another study, the effect of performance variables of players throughout a competitive season and the duration of the quality of play during the seasons of the year was shown[7], In another study, it was shown that the effects of climatic conditions on abortion more prevalent in late summer[8], another study The seasonal variations in the effects of thermogenesis on metabolic rate and substrate metabolism[9], The majority of prior investigations agreed with this study that the seasons of the year have an effect on humans. It was established that seasonal fluctuations had a considerable impact on people's nutritional status, body weights and compositions, daily energy expenditures, and specific blood vitamin levels.[14], also that the Food consumption and biochemical parameters showed significant seasonal variations in older adults.[15]. The rural community is food insecure, on a higher level during summer and autumn, which leads to the consumption of undiversified diets. The women are malnourished and obese with a risk of metabolic syndrome.[16], in early autumn and at reduced rates during midwinter and midsummer. Seasonal food consumption patterns may be related to basal metabolic activity,[17].

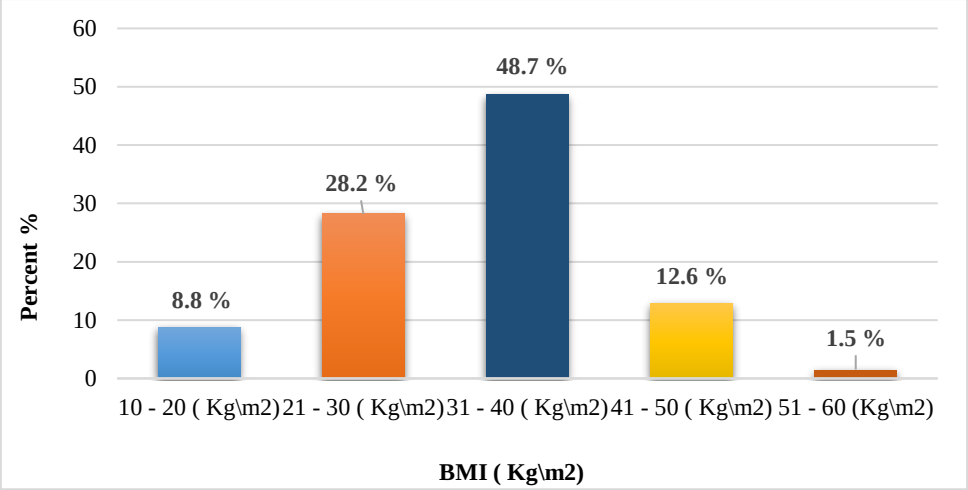

Figure 1: the percentage of BMI (Kg\ m2) during the year seasons

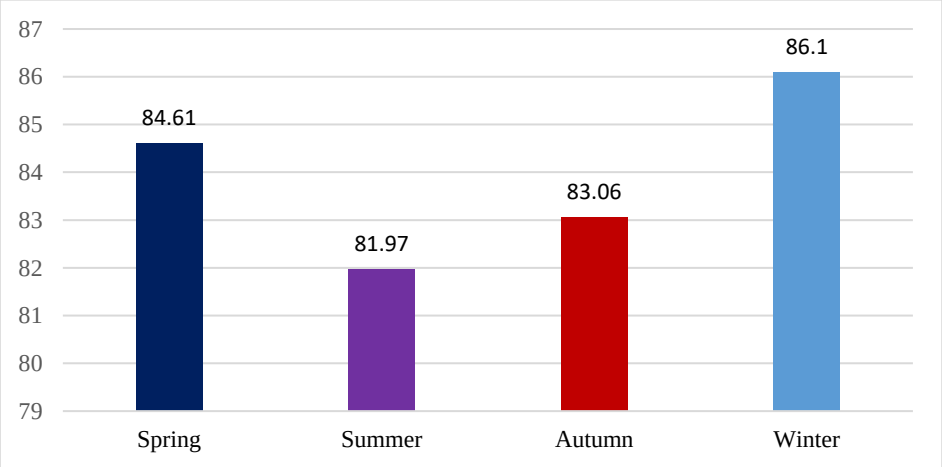

Figure 2: the effect of season's variation on body weight.

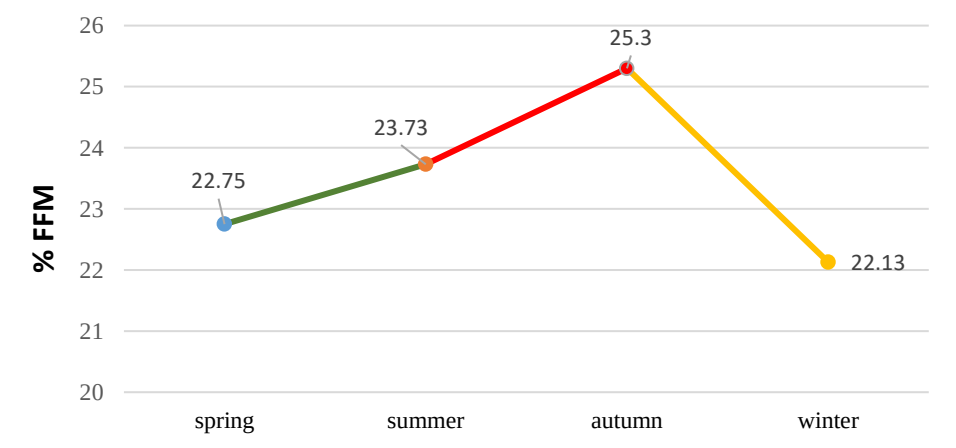

Figure 3: the effect of season's variation on body muscles strength.

Table 1: Anthropometric measurements according to season (Mean ±SD)

Variables	Summer		Winter		Autumn		Spring	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age (years)	35.99	13.8	33.89	11.71	33.43	11.37	32.20	10.99
Weight (kg)	81.97	20.08	86.10	20.57	83.06	24.96	84.61	19.86
Height (cm)	159.66	6.84	158.71	10.89	158.76	12.59	159.87	5.18
BMI (kg/m²)	32.22	8.02	33.85	7.88	32.29	8.36	33.10	7.67
WC (cm)	93.98	22.22	96.62	18.35	91.05	21.08	95.52	18.19
VF (%)	7.82	3.20	8.66	3.27	8.10	3.64	8.12	3.07
FM (%)	44.33	11.06	47.57	9.57	44.21	11.21	46.77	8.90
FFM (%)	23.73	3.42	22.13	3.56	25.30	15.70	22.75	3.97

Table 2: the correlation between Age and Anthropometric measurements

Correlations	Age (Year)	
BMI (Kg\m2)	(R)	0.362**
	(P-Value)	0.000
Waist Circumference (cm)	(R)	0.371**
	(P-Value)	0.000
Visceral Fat %	(R)	-0.390-**
	(P-Value)	0.000
Body Fat %	(R)	0.326**
	(P-Value)	0.000
Muscles %	(R)	-0.089-**
	(P-Value)	0.004
Total	**1050**	
**. Correlation is significant at the 0.01 level ((P-Value)).		
*. Correlation is significant at the 0.05 level ((P-Value)).		

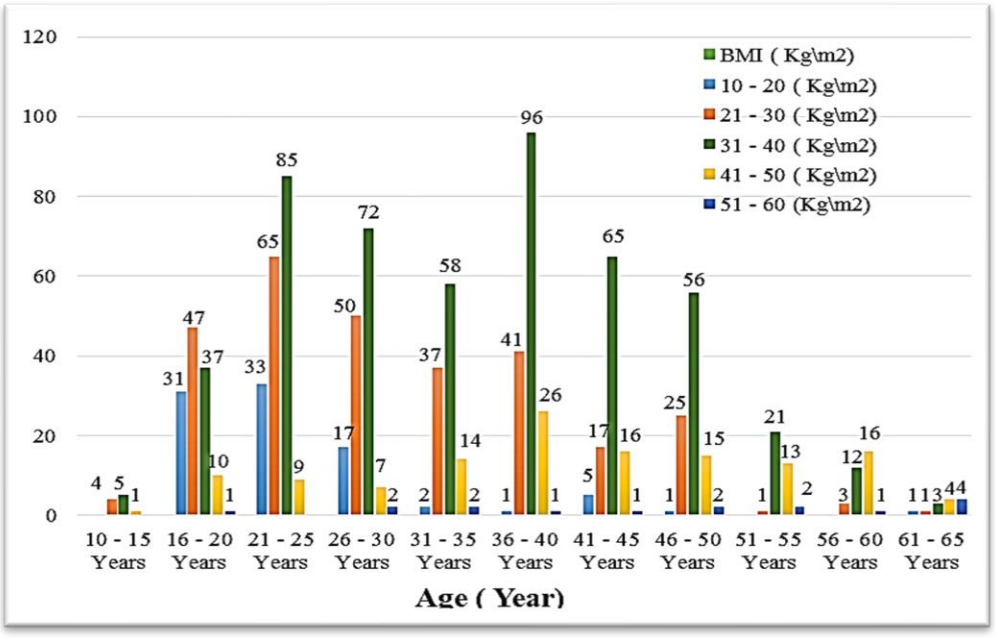

Figure 4: the relationship between age and BMI (Kg\m2)

Conclusion:
The study observed that decreased of participants' visitors to nutritionist during summer months was 9.52%, when compared with other seasons. The mean high value of height, weight, BMI, WC, VF, and FM was seen highest in winter season while the percentage of FFM was lower, as result of the increased in fat percentage during winter season when compared with other season, no significant variations were reported in this study.

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