Scientific Research Publishing

Open Journal of Applied Sciences, 2023, 13, 1387-1402
https://www.scirp.org/journal/ojapps
ISSN Online: 2165-3925
ISSN Print: 2165-3917

Obesity Prevalence in Yesonbulag, Govi-Altai, Mongolia

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How to cite this paper: Demed, O., Nyamsambuu, O., Huvtsagaan, Z., Jagdag, B., Namsrai, B., Chimed, M., Jadamba, S. and Ochirpurev, M. (2023) Obesity Prevalence in Yesonbulag, Govi-Altai, Mongolia. *Open Journal of Applied Sciences*, **13**, 1387-1402.
https://doi.org/10.4236/ojapps.2023.138110

Received: November 28, 2021
Accepted: August 27, 2023
Published: August 30, 2023

Abstract

Background: More than half (54.4 percent) of adults, one in every six children under five years old (16.7 percent), and one in every eight adolescents (12.5 percent) are overweight or obese in Mongolia. **Methods:** The study was conducted during 2015-2018 including 500 children from kindergarten №5, 350 school children aged 6 - 18 years old, 320 civil servants aged 22 - 60, 250 people in private sectors in Yesonbulag, Govi-Altai province, Mongolia. Community based Cross sectional study was undertaken. Questionnaire was used to interview the study participants and anthropometry measurements were performed. Body mass index was calculated by Kettle index (BMI = weight (kg)/height (m^2)) and SPSS-17 was utilized for statistical analysis of the data. Fasting blood was tested for parameters including glucose, high density lipoprotein, triglycerides, cholesterol in the blood test of 170 people using analyzer (SPOTCHEM™ EZ model SP-4430, Japan). **Result:** 32% of the preschool children were at risk of becoming overweight, 10% were overweight, 8% were obese, 40% of school age children were overweight, 6% of them were obese and the obesity and overweight prevalence among adolescents were statistically significant ($p < 0.0001$) than the other age group children. 34.8% of the self-employed people were overweight, 56.8% were obese and 67% of men and 87% of women had central obesity. 74.4% don't do any active physical activity or sports and 70% responded that there is a space barrier for doing sports activity. 38% of the civil servants were overweight and 30.5% were obese. The blood test for self-employed people revealed that 33.3% of them were at high risk of high cholesterol level and triglyceride, high density lipoprotein and glucose parameters were normal. 38.2% of the civil servants were at high risk of high cholesterol level. **Conclusion:** Preschool children are at risk of becoming overweight because of watching cartoons for long hours, use a lot of sweet cookies and drinks. 40% of school age children

were overweight, 6% of them were obese and 23.3% of which were adolescents. The study participants often use sweet, carbonated beverages, fast food and don't do any active physical activity and sports. 38% of civil servants were overweight, 30.5% were obese, 34.8% of the self-employed were overweight, 56.8% were obese and they don't do any active exercises and sports anymore because of not enough space. The parameters in the blood test of the self-employed people, the cholesterol level was at risk of getting higher, decreased high density lipoprotein and triglyceride and glucose were normal. 38.2% of civil servants had high level of cholesterol in the blood parameters and total cholesterol and high density lipoprotein level tend to increase between 30 - 54 years old.

Keywords

Children, Adults, Obesity, Overweight, Factors, Physical Activity, Test

1. Background

More than half (54.4 percent) of adults, one in every six children under five years old (16.7 percent), and one in every eight adolescents (12.5 percent) are overweight or obese in Mongolia [1]. In 2014, an estimated 41 million children under the age of 5 years were overweight or obese. Once considered a high-income country problem, overweight and obesity are now on the rise in low- and middle-income countries, particularly in urban settings. In Africa, the number of children who are overweight or obese has nearly doubled from 5.4 million in 1990 to 10.6 million in 2014 [2]. The prevalence of overweight and obesity among preschool children has been increasing in developing countries. According to the WHO study in 2010 which covers 144 countries 42 million preschool children were overweight and obese and 92 million were at risk of becoming overweight. Overweight prevalence was 4.2% in 1990, 6.7% in 2010 and 9.1% or 60 million children were at risk of affecting. As reported in Asian study in 2010, 11 million or 4.9% of preschool children were estimated to be overweight and obese [3]. Globally, in 2016, the number of overweight children under the age of five was estimated to be over 41 million. Almost half of all overweight children under 5 live in Asia, and the prevalence has increased at an alarming rate [4]. As reported by the WHO in 2012, globally there are 1.9 billion adolescents. One out of five people are adolescents or 85% of them are living in developing countries. While the percentage of malnutrition among adolescents is higher in developing countries, overweight and obesity among adolescents are increasing in developed countries [5]. Furthermore, an increase in adult obesity prevalence has been observed in all countries, and globally the prevalence of obesity among adults has doubled from 1980 to 2014, from 5% to 11% for men and from 8% to 15% for women [6]. Of particular concern is the very high prevalence of overweight and obesity in adults, and increasingly in children, which has reached

epidemic proportions and affects all population groups without regard to region or wealth. The increasing number of people adopting unhealthy energy-dense diets and engaging in less physical activity will further increase the prevalence of non-communicable diseases which are already the leading cause of mortality in Mongolia [7].

Since 2005, the proportion of the population with overweight and obesity have been increasing continuously. In 2013, every second person of the population aged 15 - 64 years was overweight and obese, and one in every five persons (19.7%) had obesity or increased risks of NCDs [8].

Overweight and obesity rates are increasing and are among the highest in Asia: 55% of the population is overweight and 20% is obese [9].

Obesity and overweight now affect one out of ten people in Mongolia. Childhood overweight and obesity tends to be increased recently and Mongolia ranked after Indonesia in the 2nd place.

Obesity is getting one of the urgent health problems worldwide which is increasing rapidly and it is definitely associated with a relative increase in many diseases.

According to the WHO report, 43% of illnesses and 60% of all deaths in the world population are due to non-communicable diseases. By 2020, it will account for 60% of the global illnesses and 73% of all deaths.

Overweight and obesity have become urgent global health issues in recent decades. Globally, the number of overweight children under the age of 5 years has increased from 32 million in 2000 to 41 million in 2014, corresponding to an increase in prevalence from 5.0% to 6.1% (1). It is estimated that, at the current pace, by 2020 some 9% of all children under 5 years will be overweight [3]. According to the WHO, worldwide obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese. 39 million children under the age of 5 were overweight or obese in 2020. Over 340 million children and adolescents aged 5 - 19 were overweight or obese in 2016 [2].

As reported in 2014, one out of four people is physical. Physical inactivity has been identified as the fourth leading risk factor for sickness rate and 6% of deaths globally.

According to the study in China, while 12.9% of the population is overweight and obese, it increased to 27.3% in 2004.

31.6% of the population aged 15 - 64 years in Mongolia are overweight and obese and it is getting one of the more challenging issues. Of those, 21.8% are overweight and 9.8% are obese. The percentage of overweight (25.4%) and obese (12.5%) women are higher than men (overweight 18.4% and obese 7.22%). 23.1% of the 15 - 64 years of age population are physically inactive, 34.1% (+0.05) don't do any exercises in the working place and 29.8% (+0.1) don't do muscle-strengthening activities at moderate or greater intensity in their spare time.

People are lack of knowledge on physical activity, 51% of them don't under-

stand the benefits of exersice, risks of inactivity.

As reported in 2005, 2009, and 2013 national study, the continuous increase in the prevalence of common risk factors of non-communicable diseases affects the sickness and death growth rate of non-communicable diseases caused by unhealthy lifestyle.

Survey data indicate that 23.2% of population was not meeting the minimum recommendation for physical activity, which meant nearly 1 in 4 persons were at increased risk for physical inactivity. The mean BMI of study population was 25.9 kg/m^2 and it was 25.3 kg/m^2 in men and 26.6 kg/m^2 in women, respectively. According to BMI risk assessment, 34.8% of the population was overweight and 19.7% was obese [8].

1.9 billion adults and 18 years and older were overweight and 650 million of whom were obese. As reported by the WHO, the world prevalence of obesity amongst adult population has tripled since 1975. As reported by WHO, an estimated 38.2 million children under the age of 5 years were overweight or obese in 2019 [8].

By studying the prevalence of obesity among Yesunbulag population, Govi altai province, we further aimed to organize prevention programs on specific group population and influence to policy makers to support intervention activities, collect necessary documents and provide information.

Aim: To study the obesity prevalence, some risk factors and some parameters of biochemical test among the population of Yesonbulag soum of Govi-Altai province, Mongolia.

Objectives:

1) To determine obesity prevalence and some risk factors of preschool and school children.

2) To determine obesity prevalence and some risk factors amongst self-employed people and civil servants.

3) To determine cholesterol, triglyceride, high density lipoprotein, glucose level in blood of self-employed people and civil servants who are overweight and obese.

4) To compare obesity prevalence and biochemical parameters of civil servants and self-employed people.

2. Methods

The study was conducted in 2015, 2016, 2017, 2018 respectively. Civil servants in 2015, self-employed people in 2016, preschool children in 2017, and school children in 2018.

500 preschool children aged between 2 - 5 years from 10 kindergartens, 350 school children aged between 6 - 18 years, 320 civil servants aged between 22 - 60 years and 250 private sector workers aged between 22 - 72 years in Yesonbulag soum of Govi-Altai province, Mongolia were randomly selected and involved in the study. Cross sectional descriptive methods were employed with questionnaire and body measurements. Data was analyzed on SPSS-17.

1) Preschool children

i) Questionnaire was collected from the parents of participants.

ii) Growth table in maternal and child health handbook was used.

2) School age participants

i) Questionnaire was collected.

ii) Body mass index was calculated.

3) Private business participants

i) Questionnaire.

ii) Body mass index.

iii) Biochemical test.

4) Civil servants

i) Questionnaire.

ii) Body mass index.

iii) Biochemical test was performed respectively to collect datas.

BMI

Height and weight were measured by the stadiometer and weighing scale respectively (after using toilet or before meal or 2 - 3 hours after meal).

Biochemical analysis was performed by Spotchem sp-4430 analyzer (Japan) and cholesterol, triglyceride, high density lipoprotein and glucose level were measured in fasting blood of 170 study subjects.

Procedures to perform biochemical analysis.

Using SPOTCHEM EZ SP-4430 biochemical analyzer, cholesterol, triglyceride, high density lipoprotein and glucose will be determined. Blood serum will be used in the biochemical examination and blood sample will be taken in blood collection tube with red caps. The blood samples will be centrifuged for 10 - 15 min/4000 rpm/revolutions per minute. After centrifuge stops uncap the tube and serum or plasma will be poured in the glass.

SPSS-17 was employed to analyze the data.

3. Results

1) The study results of preschool and school children.

a) Preschool age:

i) When the prevalence of obesity was determined among the preschool children in Yesonbulag Govi-Altai province, 32% were at risk of becoming overweight, 10% were overweight and 8% were obese. As for the gender, 11% of the girls were overweight, 8% were obese while 9% of boys overweight and 8% were obese (**Figure 1**).

ii) Of the children in the study, 23% were at higher risk of becoming overweight, 9% were overweight and 2% were obese. Regarding the height and age parameters, 12% were at risk of growth retardation (**Figure 2**, **Figure 3**).

iii) The most affected risk factors were cartoon watching for long hours, playing on mobile phones, high calories fast food, sweet, chips, sweet and carbonated drinks.

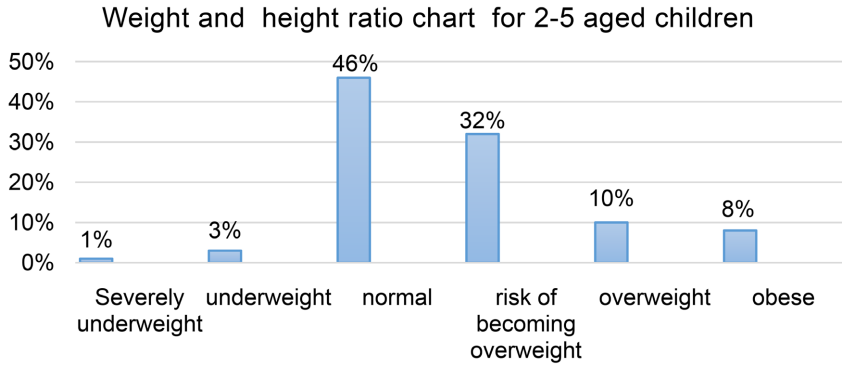

Figure 1. Weight and height.

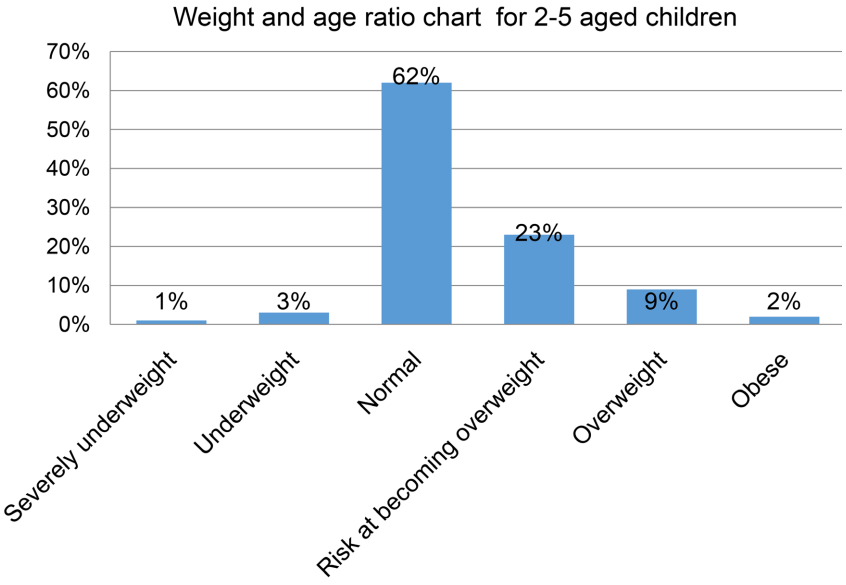

Figure 2. Weight and age.

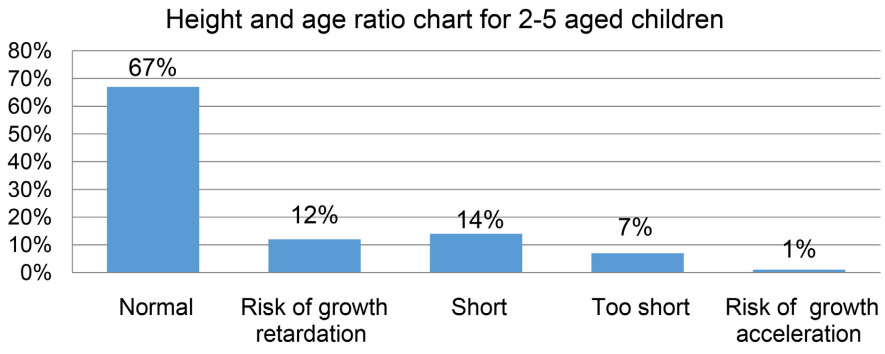

Figure 3. height and age.

b) Some study results among school age children:

i) When we determined obesity prevalence among school children in Esonbulag, Govi-Altai province, 40% were overweight and 6% were obese (**Figure 4**).

ii) Overweight and obesity prevalence among adolescent children was with significance difference $p < 0.0001$ (**Figure 5**) than other age children.

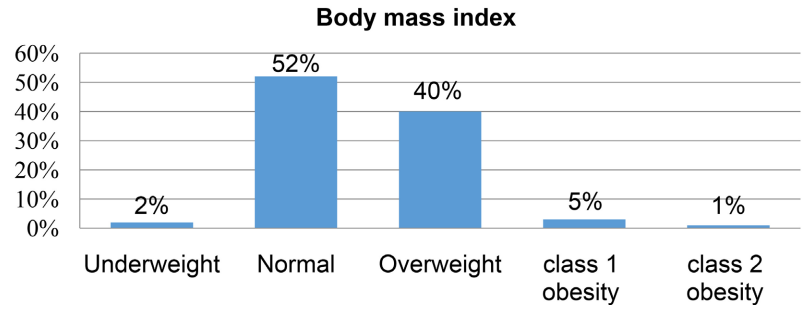

Figure 4. Body mass index.

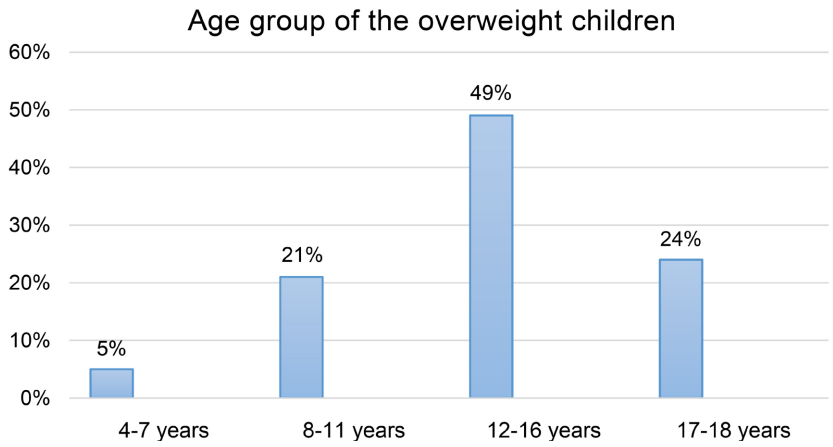

Figure 5. Age group of the overweight children.

As we can see, the childhood overweight and obesity is the results of the changing lifestyle including consuming high energy-dense diets that are high in fat content and carbohydrate but low in vitamins and minerals, and doing less physical activity because of the sedentary lifestyles such as spending more time watching television and digital playing. Therefore, strategies and interventions that can effectively prevent overweight and obesity should be implemented to restrict to marketing of foods and non-alcoholic beverages high in fats, free sugars and salt to children; reformulate of food products to reduce the total fats, free sugars and salt content and to virtually eliminate industrial trans fats from processed foods; comprehensive school policies that set standards to promote healthy eating and physical activity.

iii) When we determined the risk factors affecting obesity and overweight prevalence among school children in Esonbulag, Govi-Altai province, 56% of the participants use carbonated drinks regularly and 42% don't do any physical activity (**Figure 6**, **Figure 7**).

2) Some study results of obesity prevalence and its risk factors of private businesses and civil servants:

a) Of 250 private businesses aged between 22 - 72 years in Esunbulag Govi-Altai province, 33.6% were male and 66.4% were females (**Table 1**, **Table 2**).

As we can see (**Figure 8**), 34.8% were overweight and 56.8% were obese of the private sector businesses in Esunbulag, Govi-Altai.

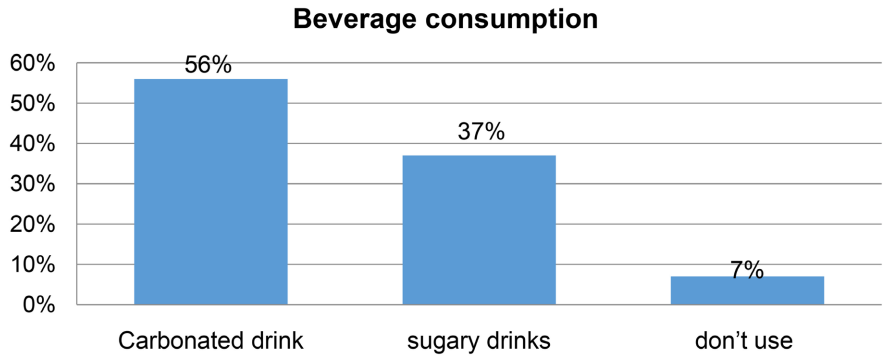

Figure 6. Beverage consumption.

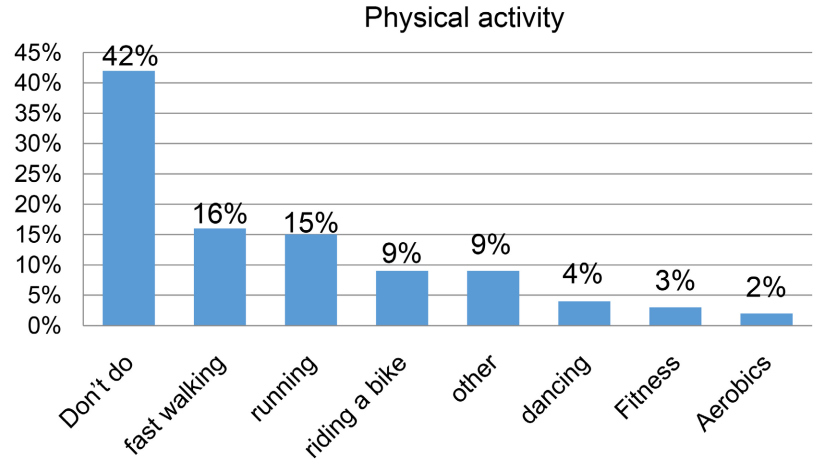

Figure 7. Active physical activity.

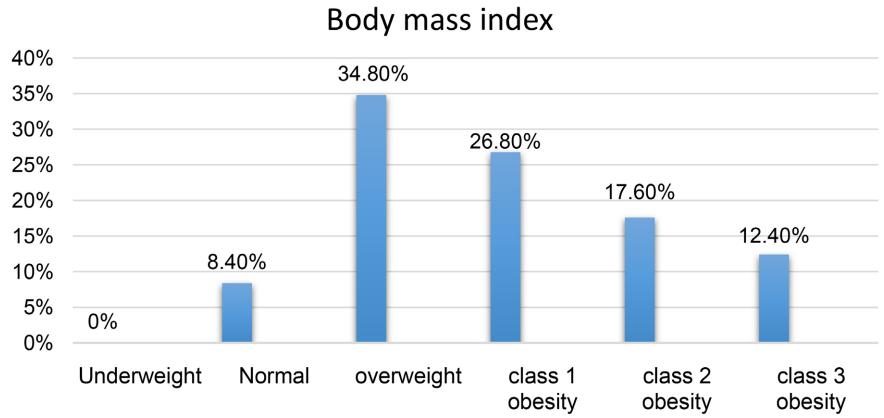

Figure 8. Body mass index.

Table 1. Age of private business participants.

Valid	250
Mean	43.0000
Std. Dev	10.30265
Min	22.00
Max	72.00

67% of the males and 87% of the female subjects had abdominal obesity. (Figure 9).

74.4% of the private businesses in the study don't do any active exercises and sports and 70% responded that they had not enough or limited space for practicing sports activities (Figure 10, Figure 11).

b) When the prevalence of obesity among civil servants and some risk factors that they face were determined among 100 male and 220 female subjects in Esunbulag, Govi-Altai, aged between 20 - 60 years, 38% were overweight and 30.5% were obese (Figure 12).

i) Regarding the abdominal obesity among the civil servants, 56% of the men and 64.5% of women participants were with abdominal obesity (Figure 13).

Table 2. Gender of private business participants.

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	84	33.6	33.6	33.6
Female	166	66.4	66.4	100.0
Total	250	100.0	100.0	

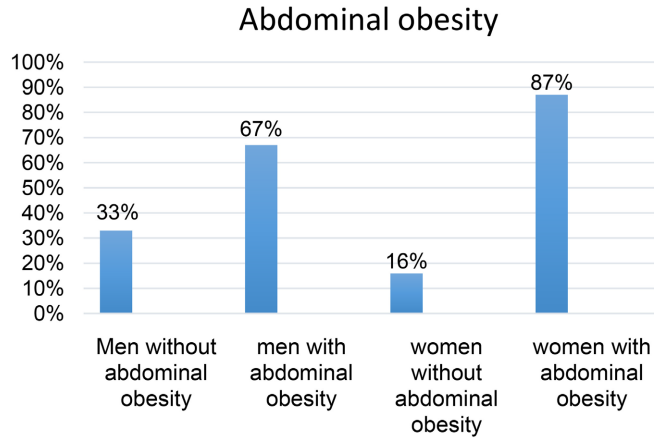

Figure 9. Abdominal obesity.

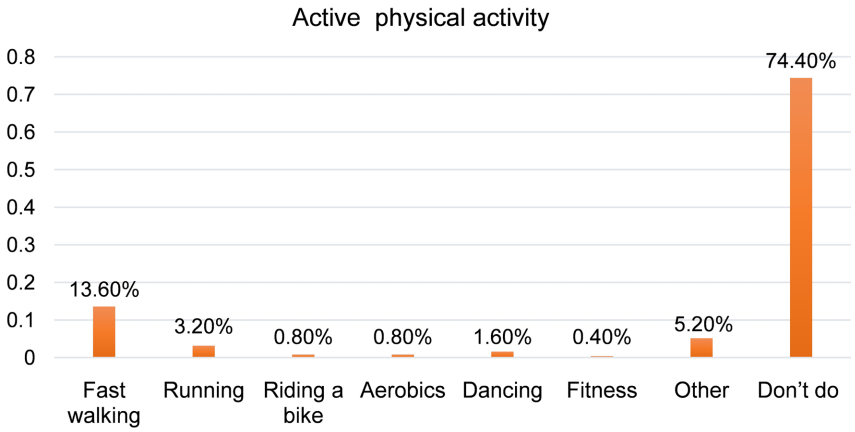

Figure 10. Active physical activity.

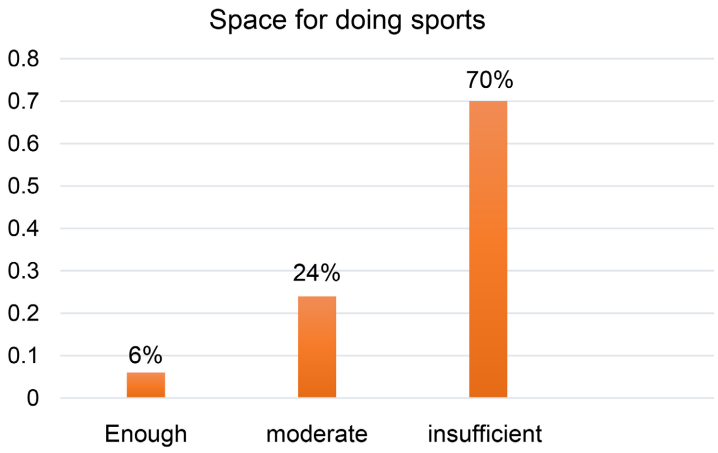

Figure 11. Space for doing sports.

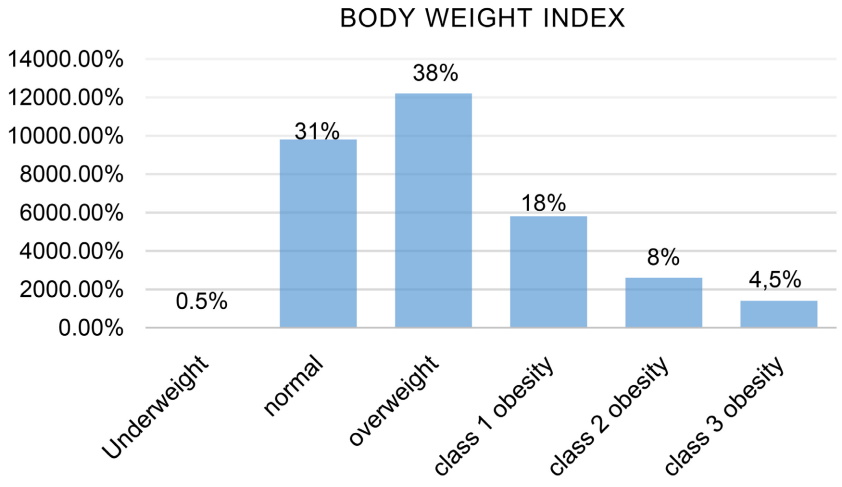

Figure 12. Body weight index.

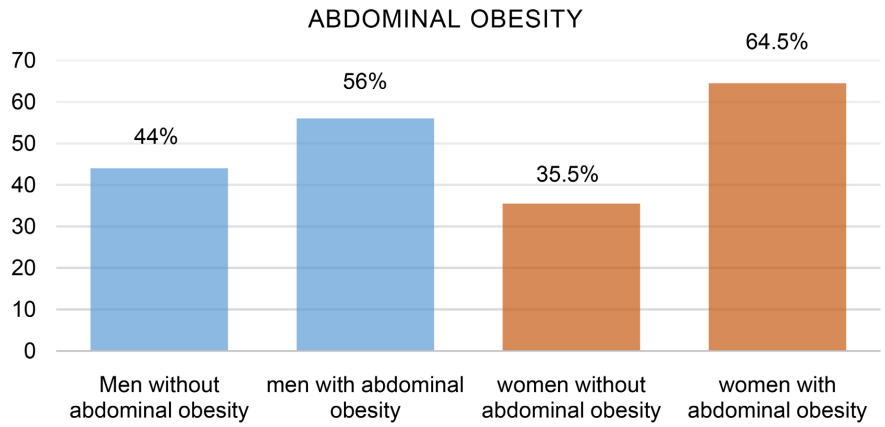

Figure 13. Abdominal obesity.

ii) When we determined some challenges to do physical activity and sports, 74% responded that they don't do active exersizes and 66% don't have enough space for doing sports (**Figure 14**, **Figure 15**).

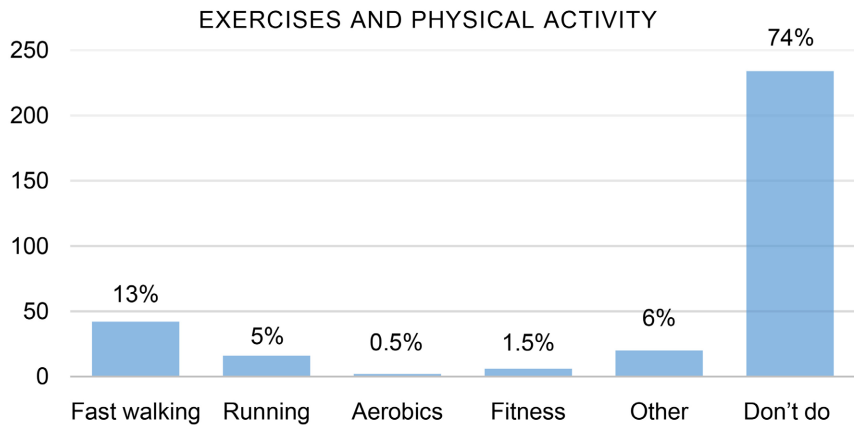

Figure 14. Exercises and physical activity.

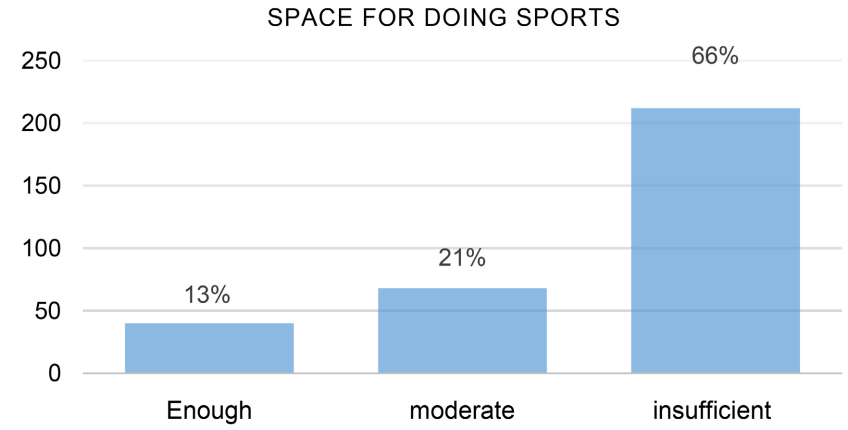

Figure 15. Space for doing sports.

33.6% of the 250 self-employed people aged 22 - 72 in Yesonbulag soum of Govi-Altai province were men and 66.4% were women (Table 1 and Table 2).

The consumption of meat among civil servants was high (Figure 16).

3) Some results of biochemical analysis of overweight and obese among private businesses and civil servants:

a) 170 private business people were involved in the study. In regard to gender, 60.5% (103) were female, 39.5% (67) were male. 33.3% were at risk of increased cholesterol and triglyceride, high density lipoprotein and glucose levels were normal.

b) When cholesterol, triglyceride, high density lipoprotein were determined in 170 civil servants of Yesunbulag, 38.2% were at higher risk of increasing level.

The maximum and minimum values and standard deviation of the age, cholesterol, triglyceride, high density lipoprotein and glucose levels of the participants were calculated by statistical parameters (Table 3).

4) Comparison results of obesity prevalence and some biochemical analysis in the blood of civil servants and private businesses:

a) When obesity and overweight level of civil servants and private businesses were compared, 38% of the civil servants were overweight and 30.5% were obese

while 34.8% of private businesses were overweight and 56.8% were obese (Figure 17).

When we compared the abdominal obesity among study participants, 67% of self-employed males, 84% of females, 56% of male civil servants and 63.5% of females were with abdominal obesity respectively (Figure 18).

b) 170 private businesses of Yesonbulag, Govi-Altai were involved in the study. In regard to gender, (103) 60.5% were female, 39.5% (67) were male. 33.3% of the subjects were at risk of getting high cholesterol level and triglyceride, high density lipoprotein and glucose were normal (Figure 19).

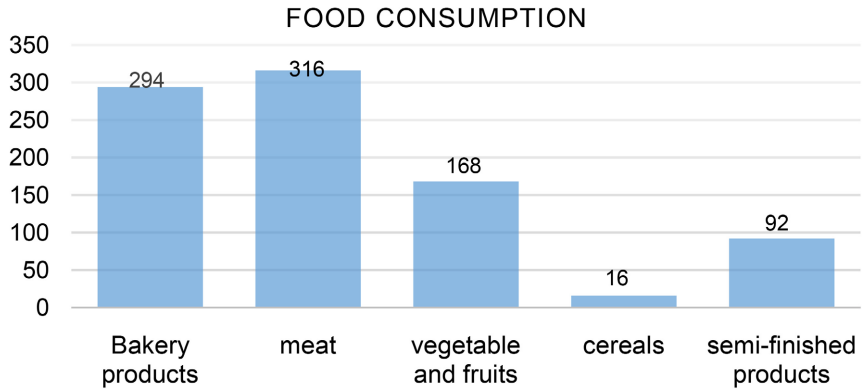

Figure 16. Food consumption.

Table 3. Descriptive statistics.

	N	Minimum	Maximum	Mean	Std. Deviation
Age	170	20.00	72.00	41.5294	12.47254
cholesterol	170	2.23	7.10	4.9229	0.88234
triglyceride	170	0.17	3.00	1.1614	0.62155
INLP	170	0.28	2.90	1.4403	0.42685
Glucose	170	2.90	8.60	5.0241	0.88835
Valid N (listwise)	170				

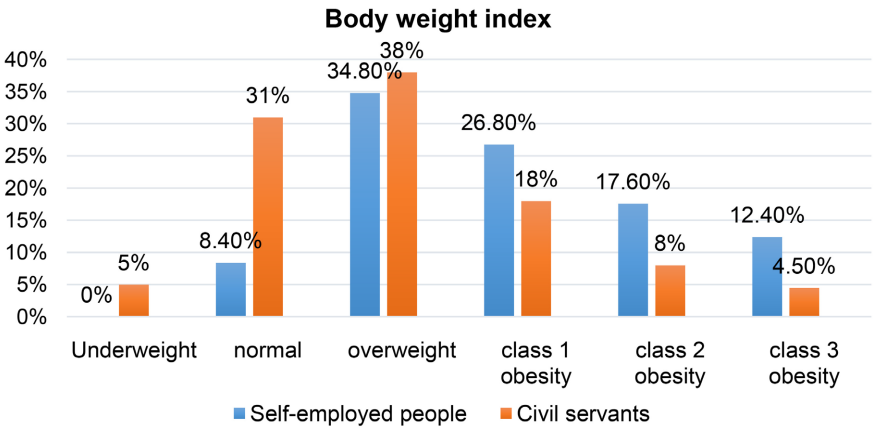

Figure 17. Comparison.

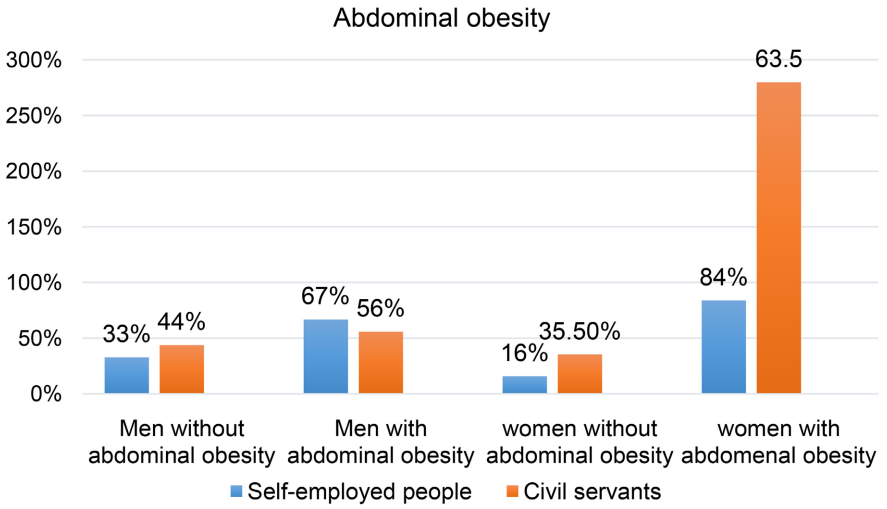

Figure 18. Comparison.

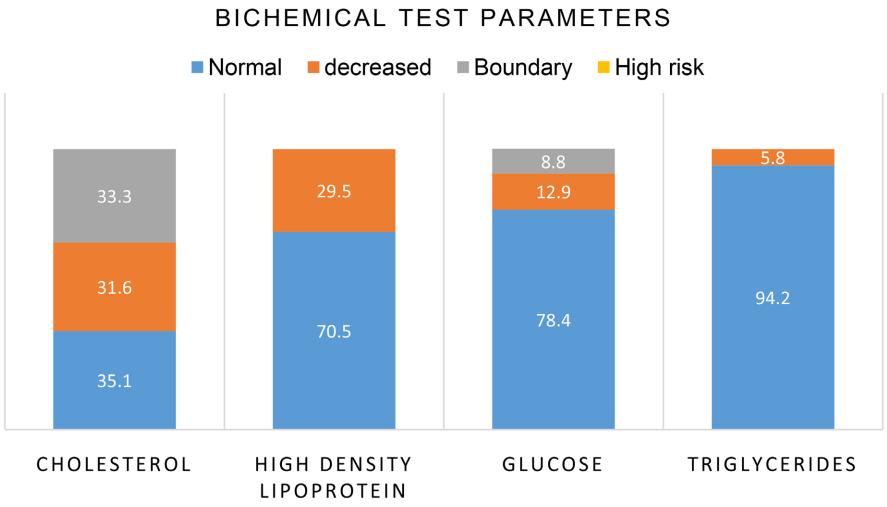

Figure 19. Biochemical test parameters.

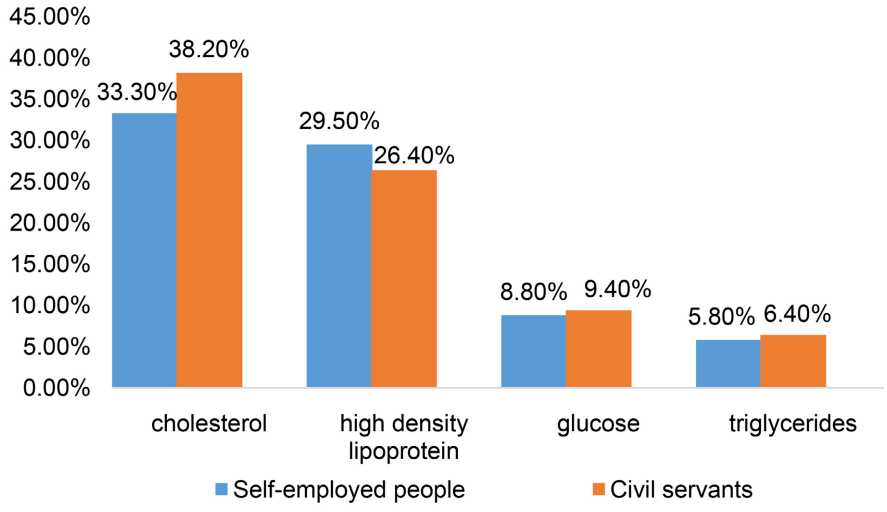

Figure 20. Comparison of parameters.

In regard to biochemical test, when cholesterol, triglyceride, high density lipoprotein and glucose level were determined, 38.2% were at risk of getting high level of cholesterol (**Figure 20**).

Preventing obesity in adults involves regular physical activity, a decrease in saturated fat intake, a decrease in sugar consumption, and an increase in fruit and vegetable consumption. In addition, family and healthcare professional involvement may help to maintain a healthy weight.

4. Discussion

According to national survey "Nutrition status of population of Mongolia" the prevalence of overweight and obesity in school children aged 6 - 11 years sharply increased from 2010 NNS IV level and reached 22.2% and 6.4%, respectively [10]. As reported by 5th national survey of Nutrition status of Mongolian population in 2016-2017, 11.7% of children under 5 years of age were overweight [7]. As stated in US survey in 2014, the prevalence of obesity among preschool-aged children (2 - 5 years) was 8.9% [11].

According to the survey conducted in Alexandra, Egypt, in 2012 involving 500 preschool children, 14% were overweight, 23% were obese. 15.8% of boys were overweight and 22.2% were obese while 12.4% of girls were overweight and 24% were obese. The study showed that most influencing risk factors are due to excess calorie intake and increased fast food consumption [12]. According to the study performed in Birjand, Iran in 2010 involving 500 children aged between 2 - 5 years, it was found that prevalence of overweight was 10.6% (11.7% in females and 9.6% in males) and obesity 7.6% (6.3% in females and 8.8% in males). The significant cause of children's obesity (watching TV for over 2 hours) was similar to our study results.

When the prevalence of obesity among school age children in Yesonbulag, Govi-Altai was determined, 40% were overweight and 6% were obese.

Our study results were similar to the Nutrition status of population of Mongolia, the fifth nutrition survey findings which aimed to measure and assess secondary school children's health behaviour (Consumption of unhealthy foods and drinks is common to 6 – 11 year old group, with almost all children (99.2%) consuming any type of unhealthy foods and drinks at least once per week, in particular, 8 out of 10 children were found consuming sugary drinks and/or deep fried food) [10].

As reported in National Health and Nutrition Examination Survey of the USA, the prevalence of obesity among adolescents (12 - 19 years; 20.6%) and school-aged children (6 - 11 years; 18.4%) was higher than among preschool-aged children (2 - 5 years; 13.9%) was identical to our study results [13].

According to the Canadian health measures survey conducted in 2009-2011, 31.5% of an estimated 1.6 million children were classified as overweight and obese [14].

38% were overweight and 30.5% were obese of civil servants of Yesonbulag,

Govi-Altai province. Our results are similar to the study outcomes of civil servants of Zavkhan province, 43.7%: overweight and 21.5%: obese [15]. When compared to Otgontuya's study, 35 - 54 aged men, 55 - 64 aged women were overweight was similar to our study results [16]. As reported in National study of 2013, 54.4% were overweight and 1937% were obese. According to the obesity prevalence study in the USA in 2013, 25% - 30% of total population was obese.

43% of participants of the obesity study among civil servants in Zavkhan province were at risk of increased cholesterol level which was (38.2%) similar to our study outcomes. Of the study subjects aged between 40 - 44 years are at risk of becoming obese and overweight which show close results (35% - 54%) of Otgontuya's study results [16].

The study results reported in National study in 2013, 54.4% were overweight, 19.7% were obese and 61.7% had high level of cholesterol level. That also indicates similar outcomes to our study.

5. Conclusions

1) Decreased physical activity due to watching cartoons for long hours, use of sweet diet and drinks are significant causes of becoming overweight in 2 - 5 years preschool children. 40% of preschool children were overweight and 23.3% were overweight adolescents. They use sweet and high calorie foods and 42 % of them were physically inactive.

2) 38% of civil servants were overweight, 30.5% were obese, 34.8% of private businesses were overweight and 56.8% were obese. The main causes were they don't do any active sports and no enough spaces.

3) As regards the biochemical test of self-employed people, there was a high risk of increased cholesterol level, decreased high density lipoprotein and normal triglyceride and glucose level while cholesterol level increased by 38.2% and total cholesterol and high density lipoprotein were at risk of increasing between 30 and 54 years olds among civil servants.

4) When the cholesterol level of blood of civil servants was compared to the private businesses it was 38.2% higher which shows statistical significance ($P < 0.001$).

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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