



ISSN: 1813-1638

The Medical Journal of Tikrit University

Available online at: [www.mjotu.com](http://www.mjotu.com)

العراقية  
المجلات الأكاديمية العلمية  
IRAQI  
Academic Scientific Journals

Mohanned H.M. Saeed \*(1)

Mohammed B. Ismail (2)

Mohammed M. Abdul-Aziz (1)

(1) Department of Surgery  
College of Medicine  
Tikrit University  
Salahaldeen  
Iraq

(2) Department of Surgery  
College of Medicine  
Baghdad University  
Baghdad  
Iraq

**Keywords:**

BMI

SFA

Sperm quality

Sex Hormones

Fertility

**ARTICLE INFO**

**Article history:**

Received 18 Dec 2018  
Accepted 27 Jan 2018  
Available online 01 June 2019

**The Relationship between Body Mass Index and Semen Quality in Infertile Males**

**ABSTRACT:**

**Background** In the recent years, studies have centered on improving the health of individuals in sustainable ways. .

The aim of this study to identify the relationship between sperm quality and BMI of adult males.

**Patients & Methods:** For that reason, the study identified a group of men who had been visiting a health clinic and unable to conceive for a period of one year, after consistent unprotected intercourse with their female partners. Relatively, the semen was collected from a total of 115 participants who were requested to abstain from sex for three days. A trained staff explained the assumptions and the intentions of the study to the participants who then, provided a written consent for using their samples. In this process, biased information was eliminated by not indicating their origin. The study is not the first one in healthcare, but there are several others that had been done and still in the process to clarify the fundaments under the topic.

**The Results:** After examination of the samples, the study identified that there is a negative correlation between BMI and sperm quality. The parameters that were used to determine sperm quality included sperm concentration, determining the type of motility and sperm count. From the results of the study, it was established that overweight and obese men had higher chances of having low sperm quality compared to the underweight and normal men. In the discussion part, the study had varied strengths including the use of men from different BMI and consistency in the examination process in the laboratory. Also, some scientific studies support the results of the study, especially in the release of sex hormones. Despite the findings, researchers are recommended to be cautious in explaining the results since they are subjective to errors considering that the female counterparts were not examined of their fertility condition.

DOI: <http://dx.doi.org/10.25130/mjotu.25.01.17>

\*Corresponding author E mail :malkumait@yahoo.com

## Introduction

People across the world encounter different health challenges and infertility is a major concern. In this case, the need for undertaking the project can be traced from the evidence that approximately 10% of families in the world have infertility problem (1). In different situations, scientists have strived to provide a solution by establishing new technology, but there is a notable gap that remains unaddressed. Therefore, identifying the extent and risk factors of infertility is a critical task that clinical researchers must undertake.

Many studies have been conducted to establish a well-defined connectivity between obesity and sub-fertility among women. In most cases, overweight women are subjective to problems related to delayed fertility, menstruation disorders and experiencing irregularities in ovulation (2). To some extent, obese women have possibilities of having negative outcomes after undergoing fertility treatment. As a result, they have higher chances of miscarriage, lower pregnancy rates, and the high demand of gonadotropins dose on the higher side.

Across the globe, fertility is a major concern since it affects the relationship of the couples and that is among the reasons studies have been

conducted to examine how body weight relates to sperm quality. Obesity is a global health concern, which is currently at the epidemic level in both developed and developing nations. These campaigns are discussed in the media and by peer groups on health-related topics. A research on this topic in 2008 indicated that obesity was in a consistent increase where one person in nine adults had an obese condition (3). Furthermore, the number of couples considered infertile is 15% in the world where men take 40% of the total (4). Therefore, male factor has a significant correlation to infertility and obesity.

The results on the relation established above need scientific proof by conducting an in-depth analysis through experimentation and interviews. However, reviewing other literature is significant since it would establish a comparison metric for the new studies. Males with the obese condition have shown delays in conception; a situation that helps researchers to comprehend that obesity has a negative effect on GnRH-FSH/LH pulse, the release of sex hormones and maturation of sperms (5). Two conditions that further explain this condition indicates that increased level of estradiol is associated with an increase in Body Mass Index

(BMI), while sex hormones and inhibin B decreases with an increase in BMI (6). In various experiments, sperm quality has been examined and the overall results have indicated that it reduces with an increase in BMI. This problem exacerbates to a point that obese men have 3 times chances of having poor sperm quality than men with normal body quality. In a clinical study that involved a total of 10000 participants, the results indicated that there is a definite relation between sperm production and obesity (7). The extent of this relationship is further explained by introducing concepts of changes in lifestyle, and alteration in the internal environment. Relatively, obesity is identified as a significant causation of the molecular structure of sperm cells in the testes, which disorients functions of sperm cells and their potential in the production process. These concerns should raise an alarm to the entire population based on the evidence that different researches are progressively establishing.

These results have been disputed in different approaches through experimentation and comparison of previous studies. For example, some studies indicate that there is no profound relationship between BMI and sperm parameters that include sperm motility, semen

volume, and concentration. A study that was done by (8) suggested that there no foundations to establish the relationship between BMI and sperm concentration, but to some extent, there is a significant negative correlation between the increase in BMI and testosterone and sex hormones. The arguments, suggestion, and experimentations provide a need to explore how BMI relates to semen quality.

## Patients and Methods

The study involved a total of 115 male participants who had failed to conceive for a period of one year with unprotected intercourse with their partners. The recruitment targeted a population of men who were visiting reproductive health centers, and who had submitted their semen samples for test and recommendation on treatments in Iraq, Salahdin Province (Samarra and Tikrit cities) for the period from January 2015-March 2018. The study did not consider the fertility condition of the female couples whom the participants had unprotected intercourse. Before conducting the research, the facilitators considered the elimination of men with disorders that might affect sperm quality like chronic kidney, neoplasm, diabetes emeritus, hypertension, and hydroceles. It was also important to eliminate men who

had been in long exposure to saunas, prolonged horse riding, obstructive azoospermia and seminal bacterial infection. Ethics in the study were observed by employing a trained staff that explained the expectation of the study established hypothesis to the participants. In the same process, the staff requested a written consent from the participants who eventually signed the agreements to provide the information. Therefore, the entire processes conducted in the study were based on agreed consent by the participants.

### Questionnaires

The questionnaires were adequately answered by all participants after the collection of sperms. The questionnaires covered a wide range of topics that included the history of participants on age, duration of the marriage and special habits.

### Physical Examination

The primary data that was collected from the participants include weight and height. In collecting the height records the participants were requested to present themselves without the shoes, relaxed hands and then, a meter ruler was used for taking the measurements on the heights. The weight was measured when the individuals were in light clothes. Then, the weight of the participants was divided with their heights to

obtain the BMI. The results from the individuals were classified on ranges to determine the underweight, normal and overweight men that are underweight  $<18.5 \text{ kg/m}^2$ , overweight  $25-29.9 \text{ kg/m}^2$ , normal weight  $18.5-24.9 \text{ kg/m}^2$ , obese  $>30 \text{ kg/m}^2$  (9).

### Sample Collection

The process followed critical steps to ensure that the samples would provide valid results without contamination or destruction. The participants were requested to prepare for samples three days before the collection by abstaining from sex. The storage and examination of sperms followed the provisions by the World Health Organization (WHO) manual in 2010. The storage was done at the temperature level of  $37.0^{\circ}\text{C}$  in an incubator to facilitate routine examination of the sperms. The outcome variables were established on measures of PH value, age, motility, concentration, sperm count, and sperm morphology.

**Statistical Analysis:** was done using SPSS 15 for windows and unpaired t-test, Mann-Whitney test for significance being P-value  $<0.05$ . The laboratory experiments were conducted by trained staff where the analysis was regularly done. The ethical standard on the collected specimens was implemented by avoiding the identification of origin to eliminate possibilities of bias based

on the ethnicity of the participants. In statistical analysis, the experiment started by classifying the participants into categories of differences of their BMI that set the fundaments of comparing the data collected in the questionnaires. The valubles selected provided amenable data on the comparison.

## Results

From the experiment, a total of 115 healthy adult men participated in the study and their results were indicated shown in Table 1 and 2. In the study, 7 men were classified as underweight  $<18.5$ , 52 found to have normal weight  $18.5-24.9 \text{ kg/m}^2$ , 36 were overweight  $25-29.9 \text{ kg/m}^2$  and a total of 20 participants were obese

$>30 \text{ kg/m}^2$ . The total sperm count for underweight men was  $110.2 \pm 36.5$ , normal weight  $108.2 \pm 38.1$ , overweight  $98.8 \pm 36.2$  and obese  $94.8 \pm 33.2$ . It is absolute that the sperm count decreases with the increase with BMI. Relatively, type A motility for obese and overweight men  $11.2 \pm 3.4$  and  $10.5 \pm 3.5$  respectively was lower than normal and underweight men  $13.6 \pm 3.2$  and  $14.2 \pm 5.2$  respectively. In the same study, the results indicated that sperm morphology varies significantly among the groups with obese and overweight men  $14.2 \pm 4.2$  and  $14.7 \pm 3.8$  respectively, which is lower than normal and underweight men  $14.8 \pm 4.5$  and  $14.7 \pm 4.2$  respectively.

Table 1: The distribution of cases according to different BMI groups.

BMI	$<18.5$	$18.5-24.9$	$25-29.9$	$>30$
Number	7	52	36	20
Age	$28.2 \pm 2.4$	$28.6 \pm 2.1$	$29.1 \pm 2.4$	$29.2 \pm 1.8$

Table : 2 Semen parameters according to different BMI groups ( n=115)

BMI groups Parameters	<18.5 n=7	18.5-24.9 n=52	25-29.9 n=36	>30 n=20	P value
<b>PH value</b>	7.4±0.6	7.4±0.5	7.4±0.6	7.3±3	0.8
<b>Volume</b>	3.1±1	3.2±1.1	3.2±1.2	3.1±1.1	0.58
<b>Type A motility</b>	14.2±5.2	13.6±3.2	10.5±3.5	11.2±3.4	0.003
<b>Type B motility</b>	24.8±5.2	27.2±8.2	26.8±7.2	26.4±6.8	0.07
<b>Type C motility</b>	19.2±5.2	20.2±5.2	20.1±5.4	19.8±5.2	0.13
<b>Sperm Concentration</b>	42.2±13.2	42.4±12.9	35.1±12.8	32.2±11.2	0.001
<b>Total sperm count</b>	110.2±36.5	108.2±38.1	98.8±36.2	94.8±33.2	0.001
<b>Sperm morphology</b>	14.7±4.2	14.8±4.5	14.2±4.2	14.7±3.8	0.25

## Discussion

From the results, it was illustrated that BMI is a factor that determines the quality of sperms; with the relationship between the two being negative correlation. In this context, obese and overweight individuals have lower sperm counts, amount of type A motility and morphology compared to normal underweight men. The findings from the study are consistent with some previous studies that have shown a significant influence of BMI on sperm

quality. Besides, there are some contradictions from other studies that do not indicate the negative correlation between high BMI and sperm parameters that is with different suggestions from the findings of this study. For example, a study done by (10) does not find any statistical significance between sperm parameters and BMIs of healthy men, and advise the participants not to worry about their BMI condition in relation to sperm quality. However, (11) in an experiment with similar

direction, find that obese and overweight men showed marked changes in sex hormone as examined in the serum, but it was not easy to establish clarity on the impact of BMI on sperm quality.

From a closer assessment, deriving the results of this study had different strengths as well as weaknesses that could affect the conclusion of the study. However, the possibilities of validating the results can be supported from different strengths profound in the process and theories on the topic under concern. At first, the collection of data was specific to an extent that all men provided the samples in one center where the analysis was done. In this context, it was possible to control the irrationalities that might arise from using different laboratories. Besides, the study acknowledged the need to include underweight men who are overlooked in most studies that place the range on normal men. Particularly, the study focused on infertile couples that did not conceive for a period of one year after regular unprotected intercourse. The population of normal, overweight and obese male participants had a relative turnout that would help in providing effective comparative results. However, the study was not subject to perfection due to some weaknesses that can be identified in the study. At first, the

study focused on infertile couples but did not provide the basis under which the male could be the cause of infertility. As a result, the samples could not be a guarantee of having the collect quality of the sperms in the study. Therefore, the researchers should be cautious in explaining the results derived from the study, especially in consideration of possible errors.

Previous studies have provided explanations that might support the result of the study. At first, the study is supported by an argument that obese and overweight men have high-fat content that result in increased production of testosterone and estrogen (12). These two hormones inhibit secretion of pituitary hormones that have a direct adverse effect to the testes. A previous study indicates that high BMI is a factor for increased production of high levels of serum leptin that limits secretion of testosterone that affects the quality of sperms (13). Further studies identify increased body weight as a factor that influences temperature and oxidation in the body that affects sperm quality on different dimensions. Overweight is closely associated with insulin resistance that in the same approach increases oxidation stress (14). When the body is in this state, it is possible for the male to experience delayed sperm maturity and production. Obese

people have high scrotal and thigh fat. These areas are sensitive to the reproduction, especially in the subjection of the sex organs to higher temperature. These high temperatures reduce sperm quality. The discussion has affirmative arguments to support the provisions in the study.

### Conclusion

From the study, a high BMI influences sperm quality negatively, that is as the BMI increases the quality of sperm reduces. Relatively, obese and overweight men are more likely to have lower sperm quality due to different adversities related to reducing secretion of sex hormones, high temperatures due to high-fat content on thighs, and increased incidences of oxidation resistance. The parameters for measuring sperm quality include sperm count, sperm concentration, and motility. The study applied statistical analysis from the participants to derive the relation between BMI and sperm quality. The study escalates concern for further investigation to identify undisputed claims on the connectivity between BMI and sperm quality.

### References

1. Boivin, J., Bunting, L., Collins, J. A., & Nygren, K. G. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. *Human reproduction.* 2007; 22(6): 1506-1512.
2. Macdonald, A. A., Stewart, A. W., & Farquhar, C. M. Body mass index in relation to semen quality and reproductive hormones in New Zealand men: a cross-sectional study in fertility clinics. *Human reproduction.* 2013;28(12): 3178-3187.
3. Stevens, G. A., Singh, G. M., Lu, Y., *et al.* National, regional, and global trends in adult overweight and obesity prevalences. *Population health metrics.* 2012;10(1): 22.
4. Güney, A. I., Javadova, D., Kırac, D., *et al.* Detection of Y chromosome microdeletions and mitochondrial DNA mutations in male infertility patients. *GenetMol Res.* 2012;11(2): 1039-1048.
5. Wang, E. Y., Huang, Y., Du, Q. Y., Yao, G. D., & Sun, Y. P. Body mass index effects sperm quality: a retrospective study in Northern China. *Asian journal of andrology.* 2017; 19(2): 234.
6. Ornstrup, M. J., Kjær, T. N., Harsløf, T. *et al.* Adipose tissue, estradiol levels, and

- bone health in obese men with metabolic syndrome. European journal of endocrinology.2015; 172(2): 205-216.
7. Belloc, S., Cohen-Bacrie, M., Amar, E., Izard, V., Benkhalifa, M., Dalléac, A., et al. High body mass index has a deleterious effect on semen parameters except morphology: results from a large cohort study. Fertility and sterility.2014; 102(5): 1268-1273.
8. MacDonald, A. A., Herbison, G. P., Showell, M., & Farquhar, C. M. The impact of body mass index on semen parameters and reproductive hormones in human males: a systematic review with meta-analysis. Human reproduction update.2009; 16(3): 293-311.
9. Janiszewski, P. Body mass index (BMI) as a measure of obesity and health: A critical appraisal. Retrieved from.
- 10.Duits, F. H., Wely, M., Veen, F., &Gianotten, J. Healthy overweight male partners of subfertile couples should not worry about their semen quality. Fertility and sterility.2010; 94(4):1356-1359.
- 11.Aggerholm, A. S., Thulstrup, A. M., Toft, G., Ramlau, C. H., &Bonde, J. P. Is overweight a risk factor for reduced semen quality and altered serum sex hormone profile?.Fertility and sterility.2008; 90(3): 619-626.
- 12.Mínguez-Alarcón, L., Chavarro , J. E., *et al*. Fatty acid intake in relation to reproductive hormones and testicular volume among young healthy men.Asian journal of andrology.2017 19(2): 184.
- 13.Hofny, E. R., Ali, M. E., Abdel-Hafez, H. Z.,*et al*. Semen parameters and hormonal profile in obese fertile and infertile males.Fertility and sterility.2010; 94(2): 581-584.
- 14.Castro, A. V. B., Kolka, C. M., Kim, S. P., & Bergman, R. N. Obesity, insulin resistance and comorbidities?Mechanisms of association.ArquivosBrasileiros de Endocrinologia & Metabologia. 2014;58(6): 600-609.