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Relation between BMI and Semen parameters in male infertility patients in west of Algeria

Ferrag Dalila, Demmouche Abbassia, Zine Charaf Khalloua

Biotoxicology Laboratory, Department of Biology. Faculty of Naturel Science and life. Djillali Liabes University; Sidi Bel Abbes. Algeria

ABSTRACT

Introduction: Body mass index BMI is a risk factor that influences semen quality and reduces male fertility. The aim of this study was to determine the impact of body mass index (BMI) on semen parameters in infertile men.

Subject and method: A total of 446 infertile men, the study population was divided into four groups depending on their BMI , underweight (<18.5 kg/), normal weight (18.5-24.99 kg/m2), overweight 25-29.99 kg/m2), and obese >30.0 kg/.semen parameters (PH, volume, concentration ,total semen count ,vitality, morphology and motility) were compared across the four BMI groups.

Results: The mean of age was 41.91±6.39, the mean infertility duration was 4.92±3.28, 351(78.7%) had primary infertility and 95(21.3%) had secondary infertility. The mean BMI was 29.38± 4.85 and the most of patients 45.2% were obese.

Conclusion: This study has found evidence of an association between BMI and semen parameters (Sperm concentration, Total sperm count, motility, and vitality**)** and no correlation between Semen volume, morphology and BMI.

Keywords: Body mass index, male infertility, semen quality, west of Algeria

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***Address for Correspondence:**

Pr Abbassia DEMMOUCHE. Professor in Biology, Biotoxicology laboratory, Department of Biology. Faculty of Naturel Science and life. Djillali Liabes University; Sidi Bel Abbes. Algeria

INTRODUCTION

Obesity is considered a major health problem[1] .is a complex, multifactorial disease that develops from the interaction between genotype and the environment. It is characterized by an excess of adipose tissue [2-3]. The most commonly used measurement for determining obesity is the body mass index (BMI), which is calculated as the weight in kilograms divided by the square of height in meters [1].Obesity is linked to human fertility. the effect of obesity on male reproduction has been less well studies than those on female reproduction, but there is growing body of male reproduction [4].The aim of this study was to investigate the impact of body mass index (BMI)on semen parameters in infertile men.

MATERIEL AND METHODS

This study included men who attended for infertility evaluation during the period from November 2016 to May 2017, in medically assisted procreation service hospital of 1st November –Oran- west of Algeria .A total of 446 infertile men, the study population was divided into four groups depending on their BMI , underweight (<18.5 kg/), normal weight (18.5-24.99 kg/m2), overweight 25-29.99 kg/m2), and obese>30.0 kg/.semen parameters (PH, volume, concentration, total semen count, vitality, morphology and motility) were compared across the four BMI groups.

Statical analysis

The data collected during the research were analyzed using the statistical software (Spss version 22). To report the results we used a descriptive analysis method, calculating the means and standard deviations for the continuous data, the means were then compared using the Student's Test, for the nominal data we calculated the percentages of the different categories .Differences in patient's BMI according to different variables were assessed using the ANOVA test.

We evaluated the impact of the different BMI determined on Semen parameters using the Pearson correlation. The result is reported in form of histograms, sectors and tables. These statistical tests were considered significant if p <0.05.

RESULTS

The result showed that ,the most represented age group is 41 – 50 years old (45, 1%) with the means age of 41.91±6.39 (years) (Fig. 1).

According to the reason for consultation we found that 78.7% of our patients have primary infertility. And 21.3% have secondary infertility (Fig. 2).

The results showed that the mean BMI of infertile men in our study was 29.38± 4.85 Kg / m2, and the most of patients 45.2% were obese (Fig. 3).

Table 1 demonstrates the value of semen parameters in studies patients according to their BMI. The results showed that was evidence of an association between BMI and semen parameters (Sperm concentration, Total sperm count, motility, and vitality**)** and no correlation between Semen volume, morphology and BMI (Table 1).

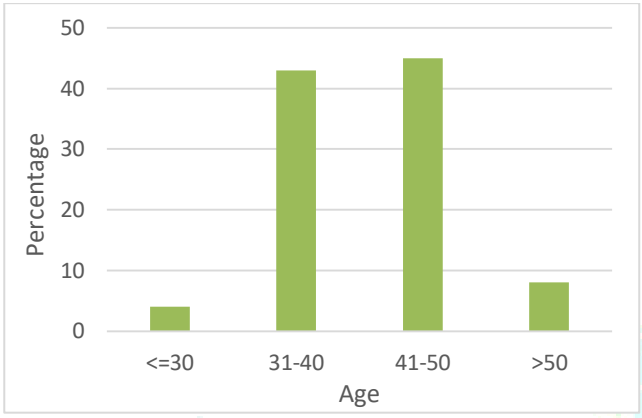

Fig. 1 Frequency distribution for the age of patients

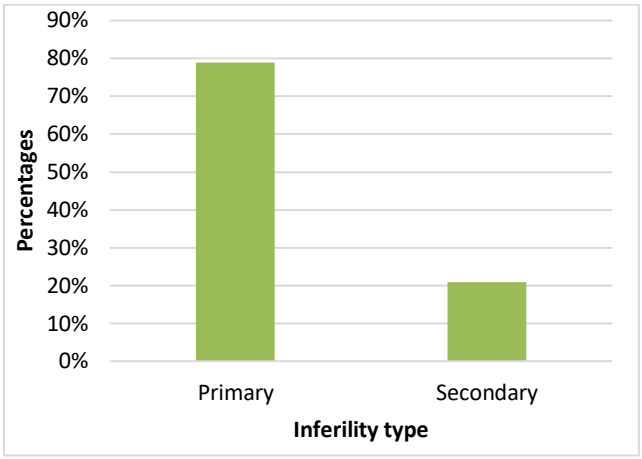

Fig. 2 Distribution of patients by type of infertility

Fig. 3 Frequency distribution for body mass index

Table 1. Semen characteristics compared for males among BMI groups.

Semen parameters	**BMI groups**				**P**
	<18.5	**18.5-24.99**	**25.00-29.99**	**>30.00**	
PH	7,00±1,41	7,86±,82	7,88±,80	7,85±,81±	0.503
Semen volume	2,45±,49	2,97±1,28	3,11±1,51	2,98±1,80	0.824
Sperm concentration	51,60±39,32	42,38±28,18	46,80±35,49	27,30±30,46	<0.001
Total sperm count	136,14±121,85	118,95±92,62	128,38±107,83	69,11±81,55	<0.001
Sperm motility after 1hour					
Progressive	15,50±5,1	24,71±4,1	24,34±2,4	14,43±1,43	<0.001
slow progressive	23,00±7,07	18,79±10,11	19,22±9,83	15,89±11,51	0.024
non progressive	20,00±2,00	15,90±1,90	15,78±5,7	14,28±4,8	0.274
immobile	41,50±17,68	40,76±20,48	40,18±21,26	53,58±25,09	<0.001
Sperm motility after 4hour					
Progressive	4,50±,71	14,00±14,53	13,54±12,07	7,25±10,19	<0.001
slow progressive	10,73±2,14	10,00±8,28	13,18±9,33	14,32±10,17	0.012
non progressive	12,55±9,63	14,00±2,83	13,97±10,19	14,25±9,70	0.204
immobile	13,20±9,94	71,50±2,12	60,29±18,22	61,71±53,80	0.263
Morphlogy					
Normal	16,00±7,07	34,99±25,74	38,03±27,99	33,42±28,61	0.358
abnormal	84,00±7,07	67,00±28,33	61,89±27,93	65,30±29,38	0.471
Vitality					
Spz vivant	64,00±24,04	68,17±18,49	69,74±19,58	56,72±24,30	<0.001
Spz mort	36,00±24,00	31,69±18,63	30,26±19,58	42,09±24,06	<0.001

DISCUSSION

Four hundred and forty six males participated in the study, after the subjects were classified into four groups based on BMI. Among 446 infertile men, 02 found with BMI <18,5 kg/m2, 72 with BMI 18.5-24,99 kg/m2, 149 with BMI 25-29,99 kg/m2 and 184 were found with BMI>30 kg/m2. When the mean semen parameter values of each BMI group were compared, our results showed no significant relationship between the BMI and semen volume (P=0.824). Similar to our results, a metanalysis of 31 relevant studies showed no significant relationship between BMI and semen volume [5].on the other side Chavarro et al. (2010) [6] reported a lower semen volume in obese men. Concerning PH, our results showed no significant relationship between the BMI and PH semen (P=0.503).

In our study, sperm concentration and total sperm count in infertile men showed a significant correlation with BMI (P<0.001). Similar to our results, Jensen et al. (2004) [7] reported a 21.6 and 23.9% significant reduction in sperm concentration and total sperm count, respectively, in men with BMI >25 compared with those classified as normal. Other studies [8-9-10]. Reported a negative relationship between sperm count and total count and BMI.

Sperm motility of the study population showed that the mean total motility, progressive and slow progressive grades of motility (after 1hour and 4 hour) were significantly correlation with BMI (P<0.001) Similar associations were recorded previously [11-12-8-9-10-13]. Other studies [14-11] reported a negative relationship between obesity and BMI and sperm motility. Some studies[7-15] failed to report any association between BMI and sperm total motility. Also, MacDonald et al. (2010)[5] in their metanalysis, did not reach a significant correlation between sperm motility and BMI. In addition, our results showed a correlation between immobile grades of motility (after 1hour) and BMI, Similar associations were recorded in nine morbidly obese patients Martini et al. (2010) [15] found a significant increase in the percentage of non-motile spermatozoa (45.7±5.5, n=9 in men with BMI≥40 vs 33.3±1.5, n=146 in men with 30≤BMI<40, P<0.024).

Concerning Sperm morphology, We did not observe a significant correlation between BMI and sperm morphology. Same results were reported by other studies[16-6-5]. However, Hofny et al. (2010)[17] stated a significant positive correlation between BMI and abnormal sperm morphology. Also others studies reported abnormal sperm morphology in obese men [17-18].

Vitality is the percentage of live spermatozoa, the WHO proposes to evaluate this factor when the motility of progressive spermatozoa is less than 40% [19] ,she finds her interest in measuring mobility because an immobile spermatozoa is not necessarily dead..our results shouwed a significant correlation between vitality and BMI (P<0.001), (table 2).

Table 2 Research Studies of the Effects of BMI on semen parameters

Author	Year Published	results/conclusion
Hofny et al [17]	**2010**	BMI had positive correlation with abnormal sperm morphology and negative
Rybar et al [20]	**2010**	**BMI was not significant in affecting sperm parameters.**
TM Stewart [21]	**2009**	There was a significantly lower sperm concentration in obese men, but this was not accompanied by significant correlations between BMI and any other semen variable.
Hammond et al [22]	**2008**	**associated with low sperm concentration and low motile sperm coun**
Aggerholm et al [23]	**2008**	Overweight had lower sperm count and concentration than normal individuals, but obese did not show reduction in sperm count surprisingly. None of these differences were significant.
Sallmen et al [24]	**2006**	**BMI has a direct negative correlation to sperm**

CONCLUSION

The general profile of infertility is polymorphous. The male causes are often multifactorial and are represented by a quantitative and/or a qualitative abnormality of the sperm. In conclusion, this study has found evidence of an association between BMI and semen parameters (Sperm concentration, Total sperm count, motility, and vitality), BMI is a risk factor that influences semen quality and reduces male fertility for that it is suggested to reduce weight in obese males to prevent hormone imbalance which may indirectly lead to sub-fertility.

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