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Impact of body mass index on semen parameters in male infertility patients in west of Algeria

Ferrag Dalila, Demmouche Abbassia*, Meziani Samira, Mai Hichem, Bouhadiba H, Zine Charaf Khalloua, Bekhada Hadjer, Bouazza Sofiane

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

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Abstract

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 BMI on semen parameters in infertile men. 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. 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. 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. This study shows as expected that obesity and overweight do have a negative impact on male infertility and as a consequence they should be taken in consideration when treating couple who suffer from infertility especially if the male partner has a BMI higher than 25. More studies in our region are needed in order to asses the other effect obesity has on the hormonal profile and the efficient of the treatment used.

* **Corresponding Author:** Demmouche Abbassia ✉ demmoucheabbassia@yahoo.fr

Introduction

In recent decades, the incidence of obesity has dramatically increased to become a true global epidemic (Andersen, 2000).It affects the majority of nations, regardless of their level of development (Deurenberg, 2003).

Algeria is not spared by this scourge of modern times, according to the world health statistics 2012, 24.3% of Algerian women aged 20 years and over are obese against 10.4% of Algerian men obese (WHO, 2013).

Obesity is considered a major health problem (WHO, 2000)**.**Itis a complex,multifactorial disease that develops from the interaction between genotype and the environnrnet. It is characterized by an excess of adipose tissue (Kopelman, 2000), (Kantachuvessiri, 2005).

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 (WHO, 2000)**.** 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 (Filer, 2009).

To our knowledge no researches have looked at the relationship between BMI and fertility in male patient in our region, this study was then done to assess the impact of obesity and overweight on semen parameters in infertile men, and to see how many infertility male have a high BMI.

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 was consulted, 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.

Statistical analyses

The data collected during the researchwereanalyzed 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 patientBMI 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 the form of histograms, sectors and tables. These statistical tests were considered significant if $p < 0.05$.

Results

The result showed thatthe most represented age group is 41 – 50years 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 nostatistical significant relationship was found between Semen volume, morphology and BMI (Table 1).

Table1. 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
Spermmotilityafter 1hour					<0.001
Progressive	15,50±5,1	24,71±4,1	24,34±2,4	14,43±1,43	0.024
Slow progressive	23,00±7,07	18,79±10,11	19,22±9,83	15,89±11,51	0.274
Non-progressive	20,00±2,00	15,90±1,90	15,78±5,7	14,28±4,8	<0.001
Immobile	41,50±17,68	40,76±20,48	40,18±21,26	53,58±25,09	
Spermmotilityafter 4hour					<0.001
Progressive	4,50±,71	14,00±14,53	13,54±12,07	7,25±10,19	0.012
Slow progressive	10,73±2,14	10,00±8,28	13,18±9,33	14,32±10,17	0.204
Non-progressive	12,55±9,63	14,00±2,83	13,97±10,19	14,25±9,70	0.263
Immobile	13,20±9,94	71,50±2,12	60,29±18,22	61,71±53,80	
Morphlogy					0.358
Normal	16,00±7,07	34,99±25,74	38,03±27,99	33,42±28,61	0.471
Abnormal	84,00±7,07	67,00±28,33	61,89±27,93	65,30±29,38	
Vitality					<0.001
Spzalive	64,00±24,04	68,17±18,49	69,74±19,58	56,72±24,30	<0.001
Spzdead	36,00±24,00	31,69±18,63	30,26±19,58	42,09±24,06	

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 **(**MacDonald *et al.*, 2010)**.**On the other side Chavarro *et al.* (2010) **(**Chavaroo *et al.*,2010)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)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 (Hammoud *et al.*, 2008) (Martini *et al.*, 2012), (Braga, 2012). 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 (Kort *et al.*,2006), (Qin *et al.*,2007), (Hammoud et la.,2008), (Martini *et al.*,2012), (Braga,2012), (Sermondade *et al.*,2012). Other

studies **(**Fejes *et al.*, 2006**), (**Kort *et al.*, 2006**)** 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) in their metanalysis, did not reach a significant correlation between sperm motility and BMI.In addition, our results showed a significate statistical relationship between immobile grades of motility (after 1hour) and BMI, Similar associations were recorded in nine morbidly obese patients (Martini *et al.*,2010)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).

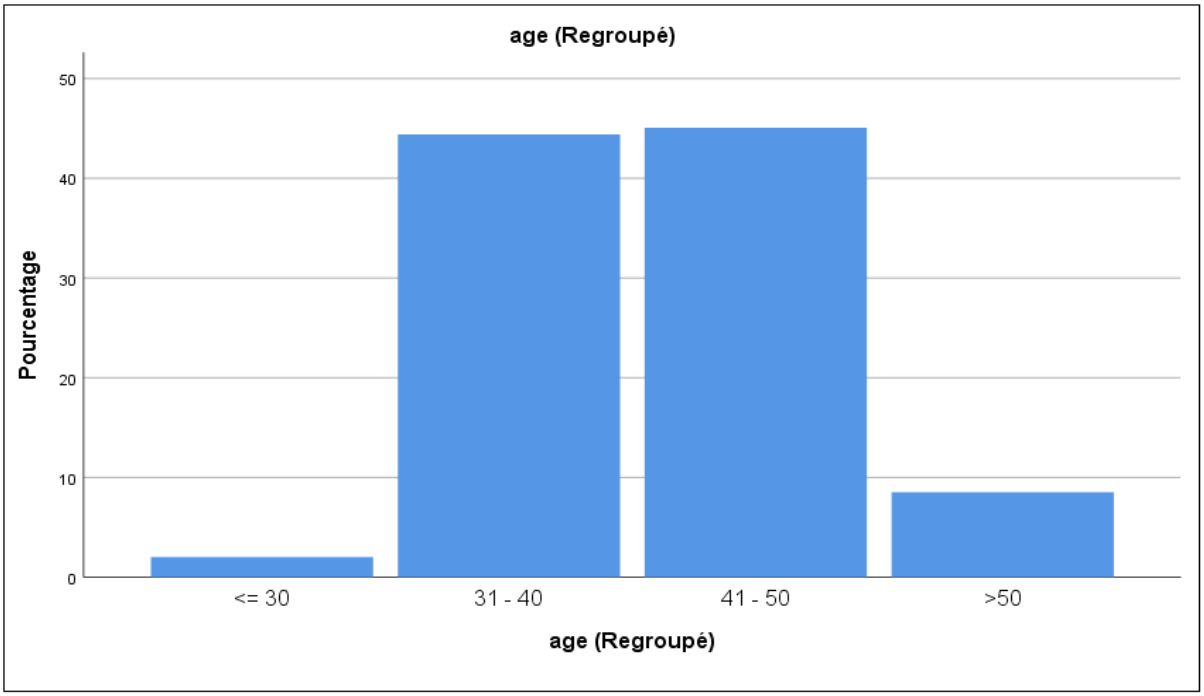

Fig. 1. Frequency distribution for the age of patients.

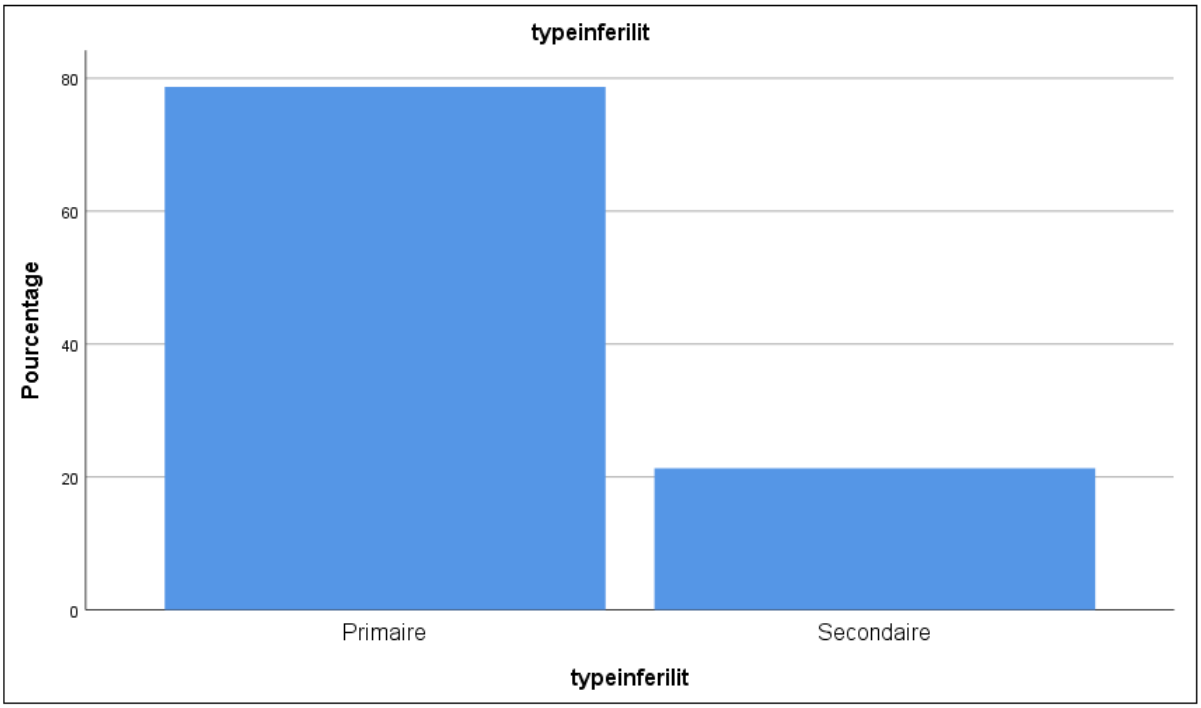

Fig. 2. Distribution of patients by type of infertility.

Concerning Sperm morphology, We did not observe a significant correlation between BMI and sperm morphology. Same results were reported by other studies (Hammoud *et al.*, 2008a), (Chavaroo *et al.*, and 2010), (MacDonald *et al.*, 2010). However, Hofny *et al.*, (2010) stated a significant positive correlation between BMI and abnormal sperm morphology. Alsoothers studies reported abnormal sperm morphology in obese men (Hofny *et al.*, 2010, Hakonsen. *et al.*, 2011)**.**

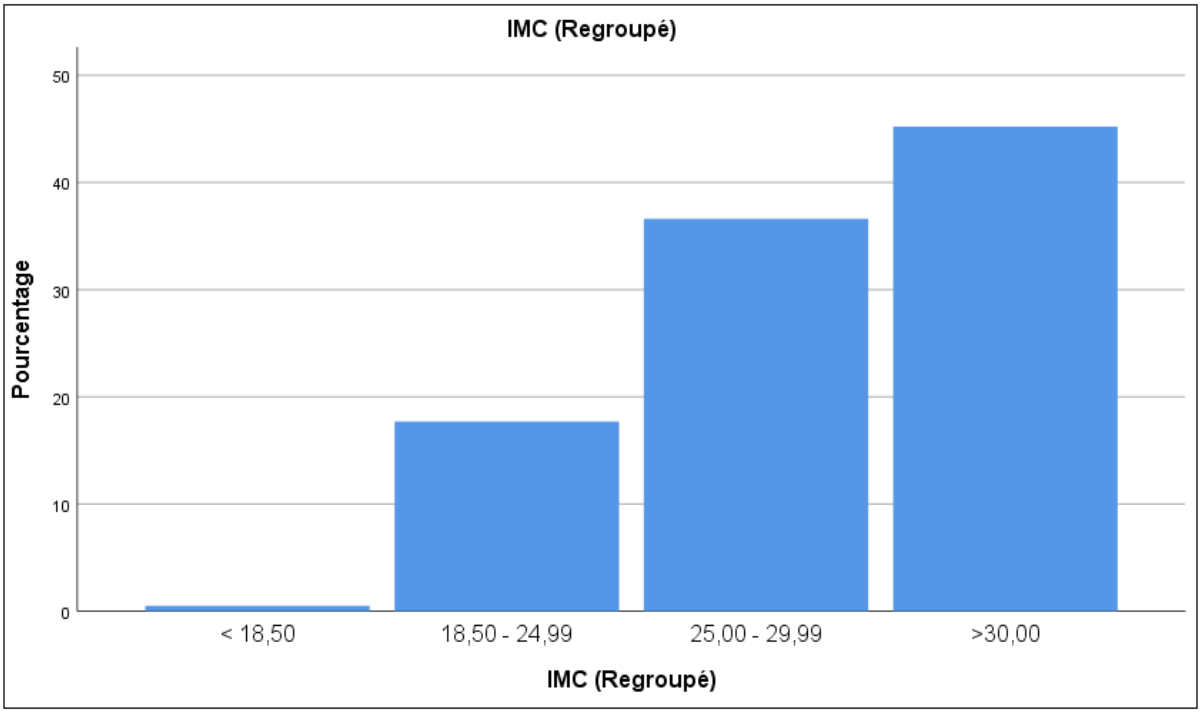

Fig. 3. Frequency distribution for body mass index.

Vitality is the percentage of live spermatozoa, the WHO proposes to evaluate this factor when the motility of progressive spermatozoa is less than 40% **(**WHO, 2002), 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).

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.

References

Andersen RE. 2000- The spread of the childhood obesity epidemic. Canadian Medical Association Journal **163(11),** 1461-1462.

Aggerholm AS, Thulstrup AM. 2008. Is overweight a risk factor for reduced semen quality and altered serum sex hormone profile? Fertility and Sterility **90(3),** 619-626.

Braga DP, Halpern G, Figueira Rde C, Setti AS, Iaconelli A Jr, Borges E Jr. 2012. Food Intake and Social Habits in Male Patients and Its Relationship to Intracytoplasmic Sperm Injection Outcomes. Fertility and Sterility **97(1),** 53-59.

Chavaro JE, Toth TL, Wright DL, Meeker JD, Hauser R. 2010. Body mass index in relation to semen quality,sperm DNA integrity,and serum reproduction hormone levels among men attending

an infertility clinic.fertility and sterility **93,** 2222-2235.

Deurenberg P, Jarosz M, Rabeneck S, Nantel G. 2003. Obésité: prévention et prise en charge de l'épidémie mondiale. OMS, Série de Rapports techniques 894, Singapour, p 299.

Fejes I, Koloszar S, Zavaczki Z, Daru J, Szollosi J, Pal A. 2006.Effect of body weight on testosterone/estradiol ratio in oligozoospermic patients. Archives of andrology **52,** 97–102.

Filer RB. 2009. Obesity and Reproduction. The Journal of Lancaster General Hospital; Reproductive Endocrinology; the Fertility Center **4(4),** 134-135.

Hakonsen LB, Thulstrup AM, Aggerholm AS, Olsen J, Bonde JP, Andersen CY, Bungum M, Ernst EH, Hansen ML, Ernst EH, Ramlau-Hansen CH. 2011. Does Weight Loss Improve Semen Quality and Reproductive Hormones? Results from a cohort of severely obese men. Danish Ramazzini Center Reprod Health **17(8),** 1-24.

Hammoud AO, Wilde N, Gibson M, Parks A, Carrell DT, Meikle AW. 2008. Male Obesity and Alteration in Sperm Parameters. Fertility and Sterility **90(6),** 2222-2225.

Hammoud AO, Gibson M, Peterson CM, Meikle AW, Carrell DT. 2008a. Impact of male obesity on infertility: a critical review of the current literature. Fertility and Sterility **90,** 897–904.

Hammoud AO, Gibson M. 2008. Impact of male obesity on infertility: a critical review of the current literature. Fertility and Sterility **90(4),** 897-904.

Hofny ER, Ali ME, Abdel-Hafez HZ, Kamal Eel D, Mohamed EE, Abd El-Azeem HG, Mostafa T. 2010. Semen parameters and hormonal profile in obese fertile and infertile males. Fertility and Sterility **94,** 581–584.

Jensen TK, Andersson AM, Jorgensen N, Andersen AG, Carlsen E, Petersen JH, Skakkebaek NE. 2004. Body Mass Index in Relation to Semen Quality and Reproductive Hormones among 1, 558 Danish Men. Fertility and Sterility **82(4),** 863-870.

Kantachuvessiri A. 2005. Obesity in Thailand. The Journal of Medical Association of Thailand **88(4),** 554-560.

Kopelman PG. 2000. Obesity as a Medical Problem. Nature **404(6778),** 43635.

Kort HI, Massey JB, Elsner CW, Mitchell-Leef D, Shapiro DB, Witt MA, Roudebush WE. 2006. Impact of Body Mass Index Values on Sperm Quantity and Quality. Reproductive Biology Associates **27(3),** 450-452.

MacDonald AA, Herbison GP, Showell M, Farquhar CM. 2010 The impact of body mass index on semen parameters and reproductive hormones in human males: a systematic review with meta-analysis. Human Reproduction Update **16,** 293–311.

Martini AC, Molina RI, Ruiz RD, Fiol de Cuneo M. 2012. Obesity and male fertility, ReviewRevista de la Facultad de CienciasMédicasCordoba **69(2),** 102110.

Martini AC, Tissera A, Estofan D, Molina RI, Mangeaud A, de Cuneo MF, Ruiz RD. 2010 Overweight and seminal quality: a study of 794 patients. FertilSteril**94,** 1739–1743.

Qin DD, Yuan W, Zhou WJ, Cui YQ, Wu JQ. Gao ES. 2007. Do Reproductive Hormones Explain The Association Between Body Mass Index and Semen Qquality? Asian Journal of Andrology **9(6),** 827-834.

Rybar R, Kopecka V. 2011. Male obesity and age in relationship to semen parameters and sperm chromatin integrity. Andrologia **43(4),** 286-291.

Sallmen M, DP Sandler. 2006. Reduced fertility among overweight and obese men. Epidemiology **17(5),** 520-523.

Sermondade N, Faure C, Fezeu L, Levy R, Czernichow S. 2012. Obesity-Fertility Collaborative Group. Obesity and Increased Risk for Oligozoospermia and Azoospermia. International Medicine **172(5),** 440442.

Stewart TM, Liu DY. 2009. Associations between andrological measures, hormones and semen quality in fertile Australian men: inverse relationship between obesity and sperm output. Human Reproduction; **24(7),** 1561-1568.

World Health Organization (WHO). 2000 Obesity: preventing and managing the global epidemic. Report of a WHOconsultation. World Health Organisation technical report series **894,** 1–12, 1-253.

World Health Organization (WHO). 2002. The International Programm on Chemical Safety (IPCS), Global assessment of the state-of-the-science of endocrine disruptors.

World Health Organization (WHO). 2013- Data and Statistics. World Health Statistics 2012. WHO Edition, Switzerland. 180 p.