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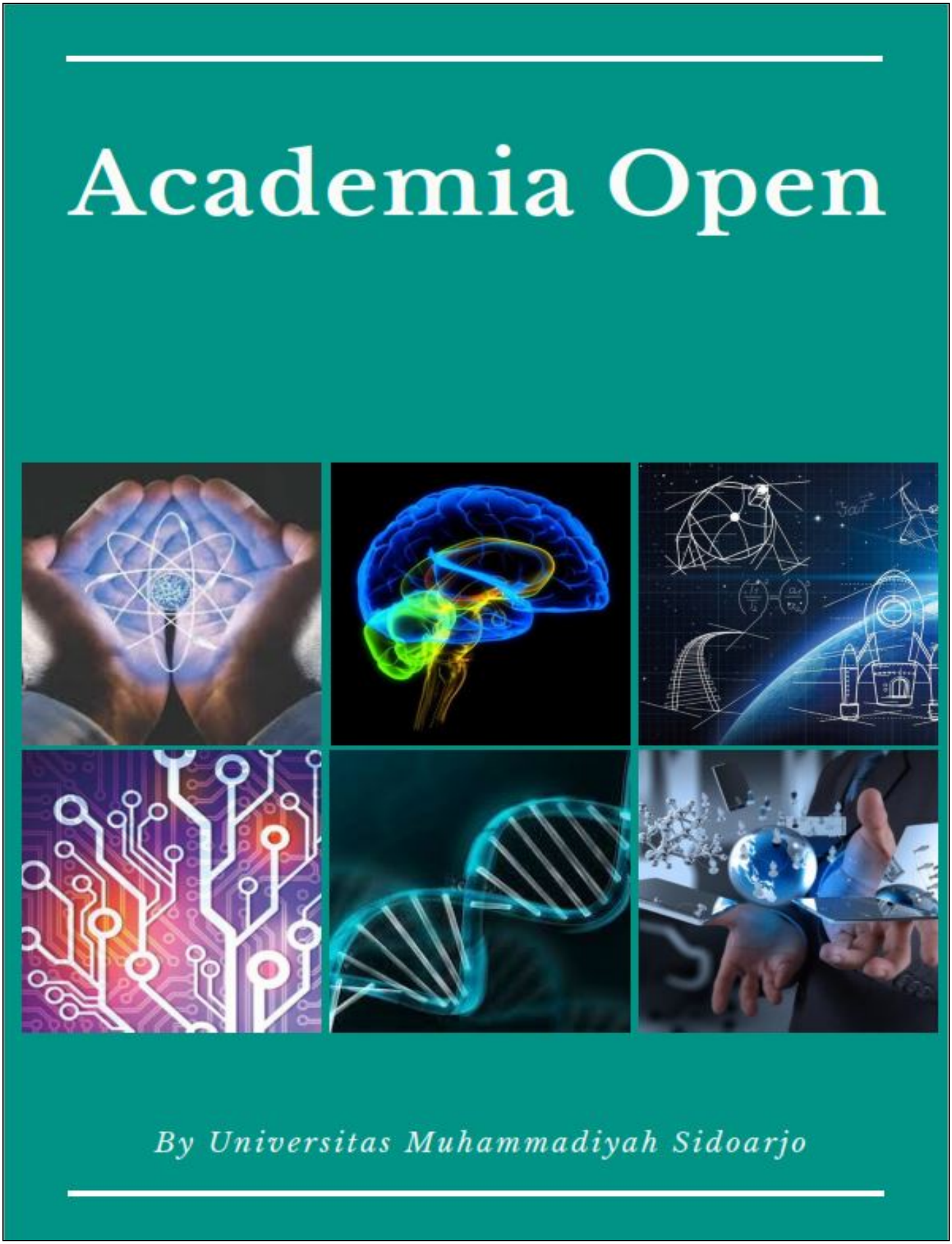

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BMI and Male Infertility: Impact on Sperm Parameters and Hormones

Hubungan antara Indeks Massa Tubuh dan Parameter Sperma, Hormon Reproduksi, dan Implikasinya terhadap Infertilitas Pria

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Abstract

This study aimed to assess the relationship between body mass index (BMI) and various indicators of men's reproductive health, specifically focusing on sperm parameters and levels of reproductive hormones, in individuals without recognized risk factors for infertility. The research employed a cross-sectional design, analyzing data from a sample of men. The results revealed a significant correlation between BMI and men's health indicators, demonstrating that BMI was associated with alterations in sperm parameters and reproductive hormone levels. Notably, BMI exhibited a negative connection with levels of both prolactin and testosterone. However, the findings emphasize the need for extensive, randomized, and prospective investigations to further elucidate the complex association between BMI and male infertility. These findings hold important implications for clinicians and researchers in the field, highlighting the importance of considering BMI as a potential risk factor for male infertility and advocating for additional research to inform diagnostic and therapeutic strategies targeting this population.

Highlights:

- The study establishes a significant correlation between body mass index (BMI) and indicators of men's reproductive health, specifically sperm parameters and reproductive hormone levels.
- BMI demonstrates a negative association with prolactin and testosterone levels, highlighting the potential impact of BMI on male infertility.
- The findings underscore the importance of considering BMI as a potential risk factor for male infertility and emphasize the need for further research to inform diagnostic and therapeutic strategies

Keywords : BMI, Male Infertility, Sperm Parameters, Reproductive Hormones, Risk Factors

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Introduction

Around 10% of families globally experience infertility, which may have an even greater impact on couples living in underdeveloped nations[1]. Infertility is the cause. while having normal, undefended sexual activity for a year. The etiology of infertility has been linked to endocrine diseases, environmental variables, oxygen radicals that are active, nutrition, both genetic and epigenetic influences. Infertility is brought on by abnormal sperm parameters in about 50% of couples who are childless. The male spouse was not found to have any infertility causes, hence these men were given the finding of idiopathic male infertility in the 30–40% of couples in which The woman's companion was found to be fertile. While primary infertility affects one in eight of these partnerships, secondary infertility affects one in six of these pairs[2].

Worldwide prevalence of obesity makes it a health issue[3]. There hasn't yet been a convincing argument made in the literature linking an increase in adipose tissue to subfertility. Potential for infertility does, however, rise if the male spouse is Having a weight problem, as the past noted[4]. Additionally, it has been stated that adipose tissue growth has a deleterious impact on female fertility[5]. High intratesticular testosterone levels are necessary for the continuation of spermatogenesis and the quality of the sperm[6]. Several variables, including sex hormone-binding globulin levels that are decreased, elevated leptin, and the adipose tissue's aromatase activity has improved, have been connected to the cause of low sperm counts and low testosterone levels[7].

According to numerous research, a men with higher body mass indices is linked to lower plasma levels of the globulin that binds to sex hormones (SHBG), testosterone, and estrogen[8]. reduced testosterone and increased estrogen long been connected to poor sperm quality and subfertility counts through rupture the hypothalamus pituitary gonadal (HPG) axis' negative feedback loop[9]. Males with higher BMI have been found to have lower levels of other hormones, including FSH/LH ratios, inhibin B, and SHBG levels, which are all implicated in the regulation of Sertoli cell activity and spermatogenesis[10]. Aberrant gametogenesis and hormonal imbalance are caused by targeted disruption of FSH signals and receptors[11].

Methods

Participants were measured for height while wearing no shoes and holding a simple metallic ruler. dressed in airy garments, weight was assessed. BMI was chosen from multiplying the kilogram the ratio of weight to height in square meters. (kg/m2).. In order to examine the data, the BMI was divided into four categories: underweight (20.0 kg/m2), normal weight (20.0–25.0 kg/m2), overweight (25.1-30.0 kg/m2), and obese (30.0 kg/m2). In order to do research on reproductive endocrinology, this BMI classification has been prop A 5 mL blood sample was obtained and delivered to a licensed laboratory to determine the levels of serum testosterone, luteinizing hormone (LH), and follicle-stimulating hormone (FSH). Data were analyzed using SPSS version 16 statistical software. FSH, LH, and testosterone mean serum sex hormone concentrations (mIU/mL, Ng/mL), The mentioned hormones were examined using the ELISA device.

Result and Discussion

Table 1 displays the patients' mean values for BMI, semen volume, concentration, duration of infertility per year, FSH, LH, and testosterone. Patients were split into Groups 1 (n = 36) and Group 2 (n = 16) based on their level of fertilty. Semen parameters varied significantly between the groups, statistically speaking. Semen parameters are not impacted by BMI ratio, while prolactin and total testosterone show a negative connection with it. In type (1) of fertility, the mean size of the bilateral varicocel/veins/mm was (1.6944), while in type (2) of fertility, it was (1.3125).

Variables	Type of fertility	Number	Mean	Std. Deviation	t-test	P-value
Age/year	1.002.00	3616	29.527838.4375	6.1434612.79046	-3.413	.009
Duration of infertility/year	1.002.00	3616	3.60006.8750	4.228202.87228	-2.815	.012

Table 1.

It was the goal of this study to find out how varicose veins are affected by age, gender, and BMI. We observed that the two most typical presenting symptoms in our patients were prominent veins and a heavy feeling in the affected limb.

Variables	Type of fertility	Number	Mean	Std. Deviation	t-test	P-value
Rt.side Varicocel/veins	1.002.00	3616	1.94441.9375	.23231.25000	.097	.217

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size /mm						
Lt.side Varicocele/veins size /mm	1.002.00	3616	1.36111.7500	.48714.44721	-2.722	.336
Bilateral Varicocel/veins size /mm	1.002.00	3616	1.69441.3125	.46718.47871	2.701	.435

Table 2.

According to Table 2, the mean of the right side varicocele/veins size /mm type (1 and 2 fertility) was significantly higher than the mean of the left side varicocele/veins size /mm type (1 and 2 fertility), which was (1.3611 and 1.7500). At scrotal ultrasonography, varicocele is a pretty typical finding. (29(Although varicocele is frequently accidental, it can cause discomfort or a feeling of weight. There is a known link with reduced sperm count as well, which may be treated with surgical ligation or embolization (29) The right-side varicocele, however, requires additional assessment. Because The drainage routes of the right and left gonadal veins diverge., the creation of a right-sided varicocele may be accompanied by an unbalanced rise in venous pressure as a result of a venous obstruction further down the line. Due to the possibility that a retroperitoneal malignancy, such as a renal one, could be the origin of an blockage of the right gonadal vein in isolation, linkage with renal ultrasonography or abdomen CT findings is frequently advised[12].

Variables	Type of fertility	Number	Mean	Std. Deviation	t-test	P-value
FSH/ Iu	1.00	36	76.867	772.176	1.003	.056
	2.00	16	56.237	411.966		
LH/IU	1.00	36	73.428	461.758	.849	.782
	2.00	16	62.600	320.666		
Test./ng/ml	1.00	36	41.131	187.693	-.618	.061
	2.00	16	44.194	.92340		
Wt /Kg	1.00	36	833.889	1.360.100	-1.912	.029
	2.00	16	910.000	1.238.817		
Hight/cm	1.00	36	1.735.278	725.647	-.258	.012
	2.00	16	1.740.625	597.181		.321
BMI	1.00	36	276.467	385.934	-2.026	.217
	2.00	16	300.650	422.242		
Group classfication	1.00	36	19.444	.62994	-2.286	.336
	2.00	16	23.750	.61914		

Table 3.

Obesity's multifaceted impact on semen parameters has been attempted to explain by a variety of pathophysiological processes (6, 7). Our findings demonstrated a significant connection between BMI and the characteristics of the menstrual cycle, the duration of infertility each year, and serum testosterone levels and FSH/Iu levels[13].

Numerous pathophysiological ideas have been put forward about the possible multifactorial link between the characteristics of sperm and male subfertility and obesity. First off, the rise in leptin levels causes the impact of LH on testicular Leydig cells to be suppressed[14]. Last but not least, the increase in estrogen levels brought on by the T/E2 ratio being reduced as a result of steroid aromatization in adipose tissue results in hypogonadotropic hyperestrogenic hypogonadism[15]. Because there are few studies examining male infertility in obese patients and because obesity may be accompanied by concomitant disorders that may influence fertility, there are differing views in the literature regarding the relationship between BMI and semen characteristics[16]. Sermondade and others (25)

Compared to the vast research done to study female subfertility, the amount of research into how body mass index (BMI), or more precisely overweight and obesity[17]

The lone study to determine a favorable correlation between BMI and sperm quantity of sperm count overall was that of Qin et al. (2007)[18]. The BMI distribution of the study population, with only 1.7% of the population being obese men, may help to explain these contradictory findings. This study also used strict exclusion criteria, which may have created significant bias. Regular drinkers, heavy smokers, and men with chronic conditions were all excluded from the study[19] Overall, nevertheless, the findings of this study were contradictory and continue to

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support the conclusion that there is no proof of a connection between BMI and semen characteristics[20].

However, Jensen et al. (2004) found sperm concentration and total sperm count have a statistically significant negative connection with BMI[21]. However, because the males in this study's sample were younger and within a healthy weight range, they are not typically representative of the male population in the majority of industrialized nations[22]. Additionally, sperm concentrations and total sperm counts varied greatly, particularly in males with normal BMI ranges, and oligozoospermia prevalence was not significantly impacted by high BMI. As a result, these findings imply that, even if BMI has an effect on sperm quantity, it is minimal and clinically irrelevant[23].

According to Jensen et al. (2004), there were significant differences in sperm concentrations and total sperm counts across the board for males with BMIs ranging from 20 to 25, but especially for those in this range[24]. Sperm concentration varied in this BMI range from 0 M/ml to over 400 M/ml. With a differential in sperm concentration of 276%, the median sperm concentration of 44 M/ml overall had a 25th to 75th percentile range of 21-79 M/ml. In the case of males with a BMI higher than 25,, While 78.3% of men in the normal weight range had sperm concentrations of >20 M/ml, 75.6% of men had sperm concentrations of 20–200 M/ml. The prevalence of

oligozoospermia did not appear to be significantly influenced by BMI. Oligozoospermia was discovered in 21.7% of men with a normal BMI, but it was present in 24.4% of men with a BMI >25.

Even so, Qin et al (2007) did discover a favorable association using straightforward correlations that are linear. these Conclusions varied throughout all of their analyses. The median values of the semen parameter of the overweight and obese groups did not substantially differ from those of the normal weight group when the values of each BMI category were examined. Additionally, there was no discernible difference in the odds ratios for low sperm concentration between the BMI categories[25].

Other significant studies revealed no or BMI and sperm only have sporadic relationships. concentration. According to Chavarro et al. (2008), there were no significant differences in sperm males of various BMI groups are concentrated, with the exception of those with a BMI >30, in Koloszár et al. (2005) study, which came to the same conclusion. The smallest studies, which included less than 100 males, had mixed findings[26]

Seven of the seven studies looked at the overall number of sperm[27]. The three largest studies discovered correlations that were consistent with their findings for sperm concentration (Jensen et al., 2004; Qin et al., 2007; Aggerholm et al., 2008). Chavarro et al. (2008) discovered a substantial unfavorable connection, but Magnusdottir et al. (2005) only discovered such a relationship in the subfertile group of men and not in the fertile ones (Magnusdottir et al., 2005).

Semen volume was calculated in six of the included studies. Five of these research, including two of the biggest studies in this evaluation, revealed no connection between BMI and semen volume . Semen volume was the subject of just one study's statistically significant correlation report, but no supporting data were provided (Chavarro et al., 2008)).

Conclusions

There is a The results of our study revealed a correlation BMI and men's health indicators. analysis of the BMI and sperm parameters are related. and reproductive hormones. Contrarily, BMI level exhibits a negative connection with levels of both prolactin and testosterone. However, extensive, randomized, and prospective investigations are required to shed light on the connection infertility in men and BMI.

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