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**Date:** 23 January 2020

**Sources Searched:** Medline, Embase

## Impact of BMI on Paternal Fertility and Miscarriage

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### 1. Adverse effects of paternal obesity on the motile spermatozoa quality.

**Author(s):** Raad, Georges; Azouri, Joseph; Rizk, Kamal; Zeidan, Nina S; Azouri, Jessica; Grandjean, Valérie; Hazzouri, Mira

**Source:** PloS one; 2019; vol. 14 (no. 2); p. e0211837

**Publication Date:** 2019

**Publication Type(s):** Research Support, Non-u.s. Gov't Clinical Trial Journal Article

**PubMedID:** 30742661

Available at [PloS one](#) - from Europe PubMed Central - Open Access

**Abstract:** Growing evidence suggests that paternal obesity may decrease male fertility potential. During infertility treatment with intra-cytoplasmic sperm injection (ICSI), a morphologically normal motile spermatozoon is injected into a mature egg, when possible. However, sperm motility and morphology per se do not reflect the sperm molecular composition. In this study, we aimed to assess the quality of motile spermatozoa in the context of obesity by analysing their conventional and molecular characteristics as well as their ability to promote early embryonic development. A prospective study was conducted on 128 infertile men divided into three groups: 40 lean, 42 overweight, and 46 obese men. Conventional sperm parameters (concentration, motility and morphology) and sperm molecular status (chromatin composition and integrity, 5-methylcytosine (5-mC) and 5-hydroxymethylcytosine (5-hmC) contents and oxidative stress level) were analysed on raw semen and/or on motile spermatozoa selected by density gradient or swim-up techniques. Morphokinetic analysis of the embryos derived from ICSI was performed using the Embryoviewer software. Our results showed that the motile sperm-enriched fraction from obese men exhibited higher levels of retained histones ( $p < 0.001$ ), elevated percentage of altered chromatin integrity ( $p < 0.001$ ), and decreased contents of 5-hmC ( $p < 0.001$ ), and 5-mC ( $p < 0.05$ ) levels as compared to that from lean men. Importantly, there were no statistically significant correlations between these molecular parameters and the percentages of morphologically normal motile spermatozoa. Regarding embryo morphokinetics, the CC1 ( $p < 0.05$ ) and CC3 ( $p < 0.05$ ) embryonic cell cycles were significantly delayed in the cleavage embryos of the obese group as compared to the embryos of the lean group. Our data is of particular interest because, besides demonstrating the negative impacts of obesity on motile spermatozoa molecular composition, it also highlights the possible risk of disturbing early embryonic cell cycles kinetics in the context of paternal obesity.

**Database:** Medline

## **2. Obesity and metabolic syndrome associated with systemic inflammation and the impact on the male reproductive system**

**Author(s):** Leisegang K.; Henkel R.; Agarwal A.

**Source:** American Journal of Reproductive Immunology; Nov 2019; vol. 82 (no. 5)

**Publication Date:** Nov 2019

**Publication Type(s):** Review

**PubMedID:** 31373727

Available at [American journal of reproductive immunology \(New York, N.Y. : 1989\)](#) - from Wiley Online Library

**Abstract:**Obesity and metabolic syndrome (MetS) are global epidemics, driven by an obesogenic environment. This is mediated by complex underlying pathophysiology, in which chronic inflammation is an important aetiological and mechanistic phenomenon. A shift towards a subclinical TH1-lymphocyte mediated innate and chronic inflammatory response is well defined in obesity and MetS, demonstrated in multiple systems including visceral adiposity, brain (hypothalamus), muscles, vasculature, liver, pancreas, testes, epididymis, prostate and seminal fluid. Inflammatory cytokines disrupt the hypothalamic-pituitary-testes axis and steroidogenesis cascades (hypogonadotropic hypogonadism), spermatogenesis (poor semen parameters, including DNA fragmentation and detrimental epigenetic modification) and results in subclinical prostatitis and prostate hyperplasia. This review aims to highlight the role of chronic inflammation in obesity and MetS, cytokines in male reproductive physiology and pathophysiology, the impact on steroidogenesis and spermatogenesis, prostate pathology and erectile dysfunction. Currently, it is recommended that clinical assessment of male infertility and reproductive dysfunction in obese and MetS patients includes inflammation assessment (highly sensitive C-reactive protein), and appropriate advice and therapeutic options are incorporated in the management options. However, the mechanisms and therapeutic options remain poorly understood and require significant interdisciplinary research to identify potential novel therapeutic strategies. Copyright © 2019 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd

**Database:** EMBASE

### **3. Is low body mass index a risk factor for semen quality? A PRISMA-compliant meta-analysis.**

**Author(s):** Guo, Dan; Xu, Min; Zhou, Qifan; Wu, Chunhua; Ju, Rong; Dai, Jiazhen

**Source:** Medicine; Aug 2019; vol. 98 (no. 32); p. e16677

**Publication Date:** Aug 2019

**Publication Type(s):** Meta-analysis Journal Article Systematic Review

**PubMedID:** 31393367

Available at [Medicine](#) - from Europe PubMed Central - Open Access

Available at [Medicine](#) - from Ovid (Journals @ Ovid) - Remote Access

**Abstract:**BACKGROUND Male infertility has become a worldwide public health problem. However, the effect of low body mass index (BMI) is still controversial. METHODS Relevant articles in Pubmed, Embase, Web of science, and Wanfang database published until September 2017 were searched without language restriction. We performed a meta-analysis about low BMI and semen parameters containing total sperm count, concentration, semen volume, and sperm motility (overall and progressive), including 709 men with low BMI and 14,622 men with normal BMI. RESULT Thirteen studies were included in this meta-analysis and a total of 15,331 individuals were accumulated. We pooled data from these articles and found standardized weighted mean differences in semen parameters (total sperm count and semen volume) showed significant difference between low BMI and normal BMI. CONCLUSION This systematic review with meta-analysis has confirmed that there was a relationship between low BMI and semen quality, which suggesting low BMI may be a harmful factor of male infertility. Yet lacking of the raw data may influence the accuracy of the results. Further researches are needed to identify the role of underweight in male sterility.

**Database:** Medline

### **4. Obesity and male hypogonadism: Tales of a vicious cycle**

**Author(s):** Carrageta D.F.; Oliveira P.F.; Alves M.G.; Monteiro M.P.

**Source:** Obesity Reviews; Aug 2019; vol. 20 (no. 8); p. 1148-1158

**Publication Date:** Aug 2019

**Publication Type(s):** Review

**PubMedID:** 31035310

Available at [Obesity reviews : an official journal of the International Association for the Study of Obesity](#) - from Wiley Online Library

**Abstract:**Obesity prevalence, particularly in children and young adults, is perilously increasing worldwide foreseeing serious negative health impacts in the future to come. Obesity is linked to impaired male gonadal function and is currently a major cause of hypogonadism. Besides signs and symptoms directly derived from decreased circulating testosterone levels, males with obesity also present poor fertility outcomes, further evidencing the parallelism between obesity and male reproductive function. In addition, males with androgen deficiency also exhibit increased fat accumulation and reduced muscle and mineral bone mass. Thus, compelling evidence highlights a vicious cycle where male hypogonadism can lead to increased adiposity, while obesity can be a cause for male hypogonadism. On the opposite direction, sustained weight loss can attain amelioration of male gonadal function. In this scenario, a thorough evaluation of gonadal function in men with obesity is crucial to dissect the causes from the consequences in order to target clinical interventions towards maximized improvement of reproductive health. This review will address the causes and consequences of the bidirectional relationship between obesity and hypogonadism, highlighting the implicit male reproductive repercussions. Copyright © 2019 World Obesity Federation

**Database:** EMBASE

**5. Obesity's role in secondary male hypogonadism: a review of pathophysiology and management issues**

**Author(s):** Seyam O.; Gandhi J.; Khan S.A.; Joshi G.; Smith N.L.

**Source:** SN Comprehensive Clinical Medicine; Jun 2019; vol. 1 (no. 6); p. 408-418

**Publication Date:** Jun 2019

**Publication Type(s):** Review

Available at [SN Comprehensive Clinical Medicine](#) - from SpringerLink - Medicine

Available at [SN Comprehensive Clinical Medicine](#) - from Unpaywall

**Abstract:**Obesity and male hypogonadism are both associated with one another. Moreover, male hypogonadism can serve as a risk factor for obesity while obesity can serve as a risk factor for male hypogonadism. There has been little research regarding obesity and its reduction on that of gonadal function. Lifestyle factors as well as other factors have been attributed to the development of obesity which can induce gonadal dysfunction. Therefore, the treatment of male hypogonadism is of great interest for both providers and patients. The future of hypogonadism therapy may exist with the development of aromatase inhibitors that can minimize undesired effects and allow the benefits of androgens. Testosterone treatment can lead to compromised fertility and addiction. Aromatase allows for the peripheral conversion of androgens into estrogens resulting in the inhibition of gonadotropin production. Therefore, aromatase inhibitors can be used instead to increase gonadotropin secretion. There is growing evidence that aromatase inhibitors can improve the fertility and raise testosterone levels. Copyright © 2019, Springer Nature Switzerland AG.

**Database:** EMBASE

## **6. The effects of maternal and paternal body mass index on live birth rate after intracytoplasmic sperm injection cycles**

**Author(s):** Arabipoor A.; Ashrafi M.; Hemat M.; Zolfaghari Z.

**Source:** International Journal of Fertility and Sterility; Apr 2019; vol. 13 (no. 1); p. 24-31

**Publication Date:** Apr 2019

**Publication Type(s):** Article

Available at [International journal of fertility & sterility](#) - from Europe PubMed Central - Open Access

Available at [International journal of fertility & sterility](#) - from ProQuest (Health Research Premium) - NHS Version

**Abstract:**Background: We designed the present study to evaluate the simultaneous effect of obesity in couples on in vitro fertilization/intracytoplasmic sperm injection (IVF/ICSI) outcomes. Material(s) and Method(s): In this cross-sectional study, performed at Royan Institute between January 2013 and January 2014, we evaluated the recorded data of all patients during this time period. The study population was limited to couples who underwent ICSI or IVF/ICSI cycles with autologous oocytes and fresh embryo transfers. We recorded the heights and weights of both genders and divided them into groups according to body mass index (BMI). Multilevel logistic regression analysis was used to determine the odds ratio for live births following ICSI or IVF/ICSI. Result(s): In total, 990 couples underwent IVF/ICSI cycles during the study period. Among the ovulatory women, a significant difference existed between the BMI groups. There was a 60% decrease [95% confidence interval (CI): 0.11-0.83] in the odds of a live birth among overweight subjects and 84% (95% CI: 0.02-0.99) decrease among obese subjects. Among the anovulatory women, the association between the BMI and live births presented no clear tendencies. We did not observe any significant relationship between male BMI and live birth rate. The results demonstrated no significant association between the couples' BMI and live birth rate. Conclusion(s): Based on the present findings, increased female BMI independently and negatively influenced birth rates after ICSI. However, increased male BMI had no impact on live births after ICSI, either alone or combined with increased female BMI. Copyright © 2019, Royan Institute (ACECR). All rights reserved.

**Database:** EMBASE

## **7. Association between obesity and sperm quality.**

**Author(s):** Ramaraju, G A; Teppala, S; Prathigudupu, K; Kalagara, M; Thota, S; Kota, M; Cheemakurthi, R

**Source:** Andrologia; Apr 2018; vol. 50 (no. 3)

**Publication Date:** Apr 2018

**Publication Type(s):** Journal Article

**PubMedID:** 28929508

Available at [Andrologia](#) - from Wiley Online Library

**Abstract:**There is awareness of likelihood of abnormal spermatozoa in obese men; however, results from previous studies are inconclusive. Advances in computer-aided sperm analysis (CASA) enable precise evaluation of sperm quality and include assessment of several parameters. We studied a retrospective cohort of 1285 men with CASA data from our infertility clinic during 2016. Obesity (BMI  $\geq 30$ ) was associated with lower (mean  $\pm$  SE) volume ( $-0.28 \pm 0.12$ , p-value = .04), sperm count ( $48.36 \pm 16.51$ , p-value = .002), concentration ( $-15.83 \pm 5.40$ , p-value = .01), progressive motility ( $-4.45 \pm 1.92$ , p-value = .001), total motility ( $-5.50 \pm 2.12$ , p-value = .002), average curve velocity ( $\mu\text{m/s}$ ) ( $-2.09 \pm 0.85$ , p-value = .001), average path velocity ( $\mu\text{m/s}$ ) ( $-1.59 \pm 0.75$ , p-value = .006), and higher per cent head defects ( $0.92 \pm 0.81$ , p-value = .02), thin heads ( $1.12 \pm 0.39$ , p-value = .007) and

pyriform heads ( $1.36 \pm 0.65$ , p-value = .02). Obese men were also more likely to have (odds ratio, 95% CI) oligospermia (1.67, 1.15-2.41, p-value = .007) and asthenospermia (1.82, 1.20-2.77, p-value = .005). This is the first report of abnormal sperm parameters in obese men based on CASA. Clinicians may need to factor in paternal obesity prior to assisted reproduction.

**Database:** Medline

## **8. Effectiveness of testosterone therapy in obese men with low testosterone levels, for losing weight, controlling obesity complications, and preventing cardiovascular events**

**Author(s):** Mangolim A.S.; Brito L.A.R.; Nunes-Nogueira V.S.

**Source:** Medicine (United States); Apr 2018; vol. 97 (no. 17)

**Publication Date:** Apr 2018

**Publication Type(s):** Review

**PubMedID:** 29703008

Available at [Medicine](#) - from Europe PubMed Central - Open Access

Available at [Medicine](#) - from Ovid (Journals @ Ovid) - Remote Access

Available at [Medicine](#) - from Unpaywall

**Abstract:**Background: The use of testosterone replacement therapy in obese men with low testosterone levels has been controversial. This review aims to analyze the effectiveness of testosterone therapy for weight loss and preventing cardiovascular complications in obese men with low testosterone levels. Method(s): We will perform a systematic review according to Cochrane Methodology of randomized studies, including crossover studies, wherein patients are allocated into one of the two groups: testosterone therapy and control (no treatment or placebo). The primary outcomes analyzed will be: weight loss, adverse events, quality of life, improvement of libido, control of obesity complications, frequency of cardiovascular events, and deaths. Four general and adaptive search strategies have been created for the following electronic health databases: Embase, Medline, LILACS, and CENTRAL. Two reviewers will independently select the eligible studies, assess the risk of bias, and extract the data from included studies. Similar outcomes measured in at least two trials will be plotted in the meta-analysis using Review Manager 5.3. The quality of evidence of the effect estimate of the intervention for the outcomes that could be plotted in the meta-analysis will be generated according to the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) Working Group. Result(s): Although testosterone replacement seems to be an attractive treatment modality for obese men with low testosterone, its potential benefits has been refuted by some studies, whose results have not shown significant differences between treated and untreated patients. Conclusion(s): For obese men with low testosterone concentrations, the proposed systematic review aims to answer the following questions: When compared with no treatment or placebo: Is testosterone therapy safe? Is testosterone therapy effective in promoting weight loss, a sustained reduction in body weight and changes in body composition? Is testosterone effective in improving quality of life, libido, and erectile function? Is testosterone therapy effective in controlling obesity complications and in preventing cardiovascular events? Copyright © 2018 the Author(s). Published by Wolters Kluwer Health, Inc.

**Database:** EMBASE

## 9. Obesity, An Enemy of Male Fertility: A Mini Review.

**Author(s):** El Salam, Mohamed Ahmed Abd

**Source:** Oman medical journal; Jan 2018; vol. 33 (no. 1); p. 3-6

**Publication Date:** Jan 2018

**Publication Type(s):** Journal Article Review

**PubMedID:** 29467992

Available at [Oman medical journal](#) - from Europe PubMed Central - Open Access

**Abstract:**Obesity is a highly prevalent non-communicable disease worldwide and is commonly associated with male infertility. Several etiopathological theories have been mentioned in the literature by which obesity affects spermatogenesis, thus affecting the male fertility potential. Mechanisms for explaining the effect of obesity on male infertility include endocrinopathy, increased aromatization activity, associated erectile dysfunction, psychological and thermal effects, obstructive sleep apnea, increased leptin and oxygen free radicals, and associated inflammatory and obstructive elements of epididymitis. Treatment of such a complex problem includes weight reduction (by lifestyle modification and increased physical activity), optimization of altered testosterone-to-estradiol ratio using aromatase inhibitors and/or gonadotropins, treatment of associated comorbidities by phosphodiesterase inhibitors for erectile dysfunction, and insulin-sensitizing agents for the management of diabetes. The aim of this mini-review is to highlight the pathological basis of this problem and to focus on obesity as an etiology of male infertility.

**Database:** Medline

## 10. Paternal obesity: how bad is it for sperm quality and progeny health?

**Author(s):** Raad, Georges; Hazzouri, Mira; Bottini, Silvia; Trabucchi, Michele; Azoury, Joseph; Grandjean, Valérie

**Source:** Basic and clinical andrology; 2017; vol. 27 ; p. 20

**Publication Date:** 2017

**Publication Type(s):** Journal Article

**PubMedID:** 29123667

Available at [Basic and clinical andrology](#) - from BioMed Central

Available at [Basic and clinical andrology](#) - from SpringerLink - Medicine

**Abstract:**There is substantial evidence that paternal obesity is associated not only with an increased incidence of infertility, but also with an increased risk of metabolic disturbance in adult offspring. Apparently, several mechanisms may contribute to the sperm quality alterations associated with paternal obesity, such as physiological/hormonal alterations, oxidative stress, and epigenetic alterations. Along these lines, modifications of hormonal profiles namely reduced androgen levels and elevated estrogen levels, were found associated with lower sperm concentration and seminal volume. Additionally, oxidative stress in testis may induce an increase of the percentage of sperm with DNA fragmentation. The latter, relate to other peculiarities such as alteration of the embryonic development, increased risk of miscarriage, and development of chronic morbidity in the offspring, including childhood cancers. Undoubtedly, epigenetic alterations (ie, DNA methylation, chromatin modifications, and small RNA deregulation) of sperm related to paternal obesity and their consequences on the progeny are poorly understood determinants of paternal obesity-induced transmission. In this review, we summarize and discuss the data available in the literature regarding the biological, physiological, and molecular consequences of paternal obesity on male fertility potential and ultimately progeny health.



**Database:** Medline

**11. Investigation of the effect of body mass index (BMI) on semen parameters and male reproductive system hormones**

**Author(s):** Keskin M.Z.; Budak S.; Yucel C.; Karamazak S.; Ilbey Y.O.; Kozacioglu Z.; Aksoy E.E.

**Source:** Archivio Italiano di Urologia e Andrologia; 2017; vol. 89 (no. 3); p. 219-221

**Publication Date:** 2017

**Publication Type(s):** Article

**PubMedID:** 28969407

Available at [Archivio italiano di urologia, andrologia : organo ufficiale \[di\] Societa italiana di ecografia urologica e nefrologica](#) - from Unpaywall

**Abstract:**Aim: To evaluate the effects of body mass index (BMI) ratio on semen parameters and serum reproductive hormones. Material(s) and Method(s): The data of 454 patients who presented to male infertility clinics in our hospital between 2014 and 2015 were analyzed retrospectively. Weight, height, serum hormone levels and semen analysis results of the patients were obtained. BMI values were calculated by using the weight and height values of the patients and they were classified as group 1 for BMI values  $\leq 25$  kg/m<sup>2</sup>, as group 2 for BMI values 25-30 kg/m<sup>2</sup> and as group 3 for BMI values  $\geq 30$  kg/m<sup>2</sup>. Result(s): The mean values of BMI, semen volume, concentration, total motility, progressive motility, total progressive motile sperm count (TPMSC), normal morphology according to Kruger, head abnormality, neck abnormality, tail abnormality, FSH, LH, prolactin, T/E2, total testosterone and estradiol parameters of the patients were considered. Patients were divided according to BMI values in Group 1 (n = 165), Group 2 (n = 222) and Group 3 (n = 56). There was no statistically significant difference in terms of all variables between the groups. Conclusion(s): We analyzed the relationship between BMI level and semen parameters and reproductive hormones, demonstrating no relationship between BMI and semen parameters. In our study, BMI does not affect semen parameters although it shows negative correlation with prolactin and testosterone levels.

**Database:** EMBASE



## **12. Obesity and male infertility.**

**Author(s):** Kahn, Barbara E; Brannigan, Robert E

**Source:** Current opinion in urology; Sep 2017; vol. 27 (no. 5); p. 441-445

**Publication Date:** Sep 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28661897

Available at [Current opinion in urology](#) - from Ovid (LWW Total Access Collection 2019 - with Neurology)

**Abstract:****PURPOSE OF REVIEW**The prevalence of obesity has risen steadily for the past 35 years and presently affects more than a third of the US population. A concurrent decline in semen parameters has been described, and a growing body of literature suggests that obesity contributes to the male infertility. The purpose of this review is to examine the effects of obesity on male fertility, the mechanisms by which impaired reproductive health arise, and the outcomes of treatment.**RECENT FINDINGS**Obesity alters the hypothalamic-pituitary-gonadal axis both centrally and peripherally, resulting in hypogonadotropic, hyperestrogenic hypogonadism. Adipose tissue-derived factors, like leptin and adipokines, regulate testosterone production and inflammation, respectively. Increased systemic inflammation results in increased reactive oxygen species and sperm DNA fragmentation. Increased testicular temperature because of body habitus and inactivity impairs spermatogenesis. The degree to which obesity affects hormone levels, semen parameters, sperm DNA integrity, and pregnancy rates is variable, which may be the result of other comorbid conditions. Treatment in the form of weight loss has also had inconsistent results.**SUMMARY**Multiple interdependent mechanisms contribute to the detrimental effect of obesity on male fertility. Large, randomized control trials are needed to better characterize the therapeutic benefits of weight loss to restore male reproductive potential.

**Database:** Medline

### 13. Paternal Diet and Obesity: Effects on Reproduction

**Author(s):** Aly J.M.; Polotsky A.J.

**Source:** Seminars in Reproductive Medicine; Jul 2017; vol. 35 (no. 4); p. 313-317

**Publication Date:** Jul 2017

**Publication Type(s):** Article

**PubMedID:** 29036738

**Abstract:** Although most research has focused on maternal obesity, there is growing data to indicate that obesity in the father can affect reproduction. Supporting data come from both mouse and human studies. Murine studies found that obese male mice exhibited decreased motility and reduced hyperactivated progression versus lean mice. Obese mice also exhibited sperm with increased levels of intracellular and mitochondrial levels of reactive oxygen species, increased sperm damage, and lower levels of capacitation, which has been shown to be associated with poor fertilization rates following in vitro fertilization, defective preimplantation embryonic development, and high rates of miscarriage and morbidity in the offspring. Furthermore, diet-induced paternal obesity was found to initiate intergenerational transmission of obesity and insulin resistance in two generations of murine offspring. Meta-analysis from human studies found obese males were more likely to demonstrate sperm DNA fragmentation, infertility, decreased live birth per cycle of assisted reproduction technology, and increased absolute risk of pregnancy nonviability, with no consistent effect on conventional semen parameters. There is a need for future studies to expound on the mechanisms of sperm DNA damage and the impact of weight loss in reversing this damage. Copyright © 2017 by Thieme Medical Publishers, Inc.

**Database:** EMBASE

### 14. Body mass index and human sperm quality: neither one extreme nor the other.

**Author(s):** Luque, E M; Tissera, A; Gaggino, M P; Molina, R I; Mangeaud, A; Vincenti, L M; Beltramone, F; Larcher, J Sad; Estofán, D; Fiol de Cuneo, M; Martini, A C

**Source:** Reproduction, fertility, and development; Apr 2017; vol. 29 (no. 4); p. 731-739

**Publication Date:** Apr 2017

**Publication Type(s):** Journal Article

**PubMedID:** 26678380

**Abstract:** The aim of the present study was to investigate the still contentious association between body mass index (BMI) and seminal quality. To this end, 4860 male patients (aged 18-65 years; non-smokers and non-drinkers), were classified according to BMI as either underweight (UW; BMI <20kgm<sup>-2</sup>; n=45), normal weight (NW; BMI 20-24.9kgm<sup>-2</sup>; n=1330), overweight (OW; BMI 25-29.9kgm<sup>-2</sup>; n=2493), obese (OB; BMI 30-39.9kgm<sup>-2</sup>; n=926) or morbidly obese (MOB; BMI ≥40kgm<sup>-2</sup>; n=57). Conventional semen parameters and seminal concentrations of fructose, citric acid and neutral α-glucosidase (NAG) were evaluated. The four parameters that reflect epididymal maturation were significantly lower in the UW and MOB groups compared with NW, OW and OB groups: sperm concentration, total sperm count (103.3±11.4 and 121.5±20.6 and vs 157.9±3.6, 152.4±2.7 or 142.1±4.3 spermatozoa ejaculate<sup>-1</sup> respectively, P<0.05), motility (41.8±2.5 and 42.6±2.6 vs 47.8±0.5, 48.0±0.4 or 46.3±0.6 % of motile spermatozoa respectively, P<0.05) and NAG (45.2±6.6 and 60.1±7.9 vs 71.5±1.9, 64.7±1.3 or 63.1±2.1 mU ejaculate<sup>-1</sup> respectively, P<0.05). Moreover, the percentage of morphologically normal spermatozoa was decreased in the MOB group compared with the UW, NW, OW and OB groups (4.8±0.6% vs 6.0±0.8%, 6.9±0.1%, 6.8±0.1 and 6.4±0.2%, respectively; P<0.05). In addition, men in the MOB group had an increased risk (2.3- to 4.9-fold greater) of suffering oligospermia and teratospermia (P<0.05). Both morbid obesity and

being underweight have a negative effect on sperm quality, particularly epididymal maturation. These results show the importance of an adequate or normal bodyweight as the natural best option for fertility, with both extremes of the BMI scale as negative prognostic factors.

**Database:** Medline

### **15. Obesity, male infertility, and the sperm epigenome.**

**Author(s):** Craig, James R; Jenkins, Timothy G; Carrell, Douglas T; Hotaling, James M

**Source:** Fertility and sterility; Apr 2017; vol. 107 (no. 4); p. 848-859

**Publication Date:** Apr 2017

**Publication Type(s):** Journal Article Review

**PubMedID:** 28366411

Available at [Fertility and sterility](#) - from Unpaywall

**Abstract:**Obesity is a growing epidemic and a common problem among reproductive-age men that can both cause and exacerbate male-factor infertility by means of endocrine abnormalities, associated comorbidities, and direct effects on the fidelity and throughput of spermatogenesis. Robust epidemiologic, clinical, genetic, epigenetic, and nonhuman animal data support these findings. Recent works in the burgeoning field of epigenetics has demonstrated that paternal obesity can affect offspring metabolic and reproductive phenotypes by means of epigenetic reprogramming of spermatogonial stem cells. Understanding the impact of this reprogramming is critical to a comprehensive view of the impact of obesity on subsequent generations. Furthermore, and perhaps more importantly, conveying the impact of these lifestyle changes on future progeny can serve as a powerful tool for obese men to modify their behavior. Reproductive urologists and endocrinologists must learn to assimilate these new findings to better counsel men about the importance of paternal preconception health, a topic recently being championed by the Centers for Disease Control and Prevention.

**Database:** Medline

### **16. Obesogens and male fertility.**

**Author(s):** Cardoso, A M; Alves, M G; Mathur, P P; Oliveira, P F; Cavaco, J E; Rato, L

**Source:** Obesity reviews : an official journal of the International Association for the Study of Obesity; Jan 2017; vol. 18 (no. 1); p. 109-125

**Publication Date:** Jan 2017

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article Review

**PubMedID:** 27776203

Available at [Obesity reviews : an official journal of the International Association for the Study of Obesity](#) - from Wiley Online Library

**Abstract:**In the last decades, several studies evidenced a decrease in male fertility in developed countries. Although the aetiology of this trend in male reproductive health remains a matter of debate, environmental compounds that predispose to weight gain, namely obesogens, are appointed as contributors because of their action as endocrine disruptors. Obesogens favour adipogenesis by an imbalance of metabolic processes and can be found virtually everywhere. These compounds easily accumulate in tissues with high lipid content. Obesogens change the functioning of male reproductive axis, and, consequently, the testicular physiology and metabolism that are pivotal for spermatogenesis. The disruption of these tightly regulated metabolic pathways leads to

adverse reproductive outcomes. Notably, adverse effects of obesogens may also promote disturbances in the metabolic performance of the following generations, through epigenetic modifications passed by male gametes. Thus, unveiling the molecular pathways by which obesogens induce toxicity that may end up in epigenetic modifications is imperative. Otherwise, a transgenerational susceptibility to metabolic diseases may be favoured. We present an up-to-date overview of the impact of obesogens on testicular physiology, with a particular focus on testicular metabolism. We also address the effects of obesogens on male reproductive parameters and the subsequent consequences for male fertility.

**Database:** Medline

### **17. The impact of body mass index on semen parameters in infertile men.**

**Author(s):** Alshahrani, S; Ahmed, A-F; Gabr, A H; Abalhassan, M; Ahmad, G

**Source:** Andrologia; Dec 2016; vol. 48 (no. 10); p. 1125-1129

**Publication Date:** Dec 2016

**Publication Type(s):** Journal Article

**PubMedID:** 26847036

Available at [Andrologia](#) - from Wiley Online Library

**Abstract:** This hospital-based, prospective study was conducted to evaluate the relationship between body mass index (BMI) and various semen parameters in infertile men. A total of 439 men presented for infertility evaluation were assessed by basic infertility evaluation measures including semen analysis and BMI calculation. The main outcome measure was the relationship between BMI groups [BMI: 18.5-24.9 kg/m<sup>2</sup> (normal weight), 25-29.9 kg/m<sup>2</sup> (overweight) and ≥30 kg/m<sup>2</sup> (obese)] and different semen parameters [volume, concentration, motility and morphology]. The mean BMI was 29.67 ± 5.89. Most of patients (82.91%) were overweight or obese. The 3 BMI groups were comparable in semen parameters ( $P > 0.05$ ). BMI had a negative correlation with various semen parameters. However, this correlation was significant only with sperm concentration ( $P = 0.035$ ). We concluded that sperm concentration was the only semen parameter which showed significant reduction with higher BMI in infertile men.

**Database:** Medline

### 18. Does being overweight affect seminal variables in fertile men?

**Author(s):** Taha, Emad A; Sayed, Sohair K; Gaber, Hisham D; Abdel Hafez, Hatem K; Ghandour, Nagwa; Zahran, Asmaa; Mostafa, Taymour

**Source:** Reproductive biomedicine online; Dec 2016; vol. 33 (no. 6); p. 703-708

**Publication Date:** Dec 2016

**Publication Type(s):** Journal Article

**PubMedID:** 27697451

Available at [Reproductive biomedicine online](#) - from Unpaywall

**Abstract:**The effect of being overweight on seminal variables was assessed in 165 fertile men. Participants were divided into three groups: fertile men with normal body mass index (BMI) (18.5-24.9 kg/m<sup>2</sup>), fertile overweight men (BMI 25-29.9 kg/m<sup>2</sup>) and fertile obese men (BMI >30 kg/m<sup>2</sup>). Medical history was taken, a clinical examination conducted. Semen analysis was undertaken and BMI measured. Seminal reactive oxygen species (ROS) was estimated by chemiluminescent assay, sperm vitality by the hypo-osmotic swelling test and sperm DNA fragmentation by propidium iodide staining with flowcytometry. Fertile obese men had significantly lower sperm concentration, progressive sperm motility and sperm normal morphology, with significantly higher seminal ROS and sperm DNA fragmentation compared with fertile normal-weight men and overweight men (all  $P < 0.05$ ). BMI was negatively correlated with sperm concentration ( $r = -0.091$ ;  $P = 0.014$ ), progressive sperm motility ( $r = -0.697$ ;  $P = 0.001$ ), normal sperm morphology ( $r = -0.510$ ;  $P = 0.001$ ), sperm vitality ( $r = -0.586$ ;  $P = 0.001$ ), but positively correlated with sperm DNA fragmentation percentage ( $r = 0.799$ ;  $P = 0.001$ ) and seminal ROS ( $r = 0.673$ ;  $P = 0.001$ ). Increased BMI was found to affect semen parameters negatively even in fertile men.

**Database:** Medline

### 19. Influence of increasing body mass index on semen and reproductive hormonal parameters in a multi-institutional cohort of subfertile men.

**Author(s):** Bieniek, Jared M; Kashanian, James A; Deibert, Christopher M; Grober, Ethan D; Lo, Kirk C; Brannigan, Robert E; Sandlow, Jay I; Jarvi, Keith A

**Source:** Fertility and sterility; Oct 2016; vol. 106 (no. 5); p. 1070-1075

**Publication Date:** Oct 2016

**Publication Type(s):** Multicenter Study Journal Article

**PubMedID:** 27460460

Available at [Fertility and sterility](#) - from Unpaywall

**Abstract:**OBJECTIVETo determine whether obesity affects serum and seminal measures of male reproductive potential among a multi-institutional cohort.DESIGNRetrospective multi-institutional cohort study.SETTINGInfertility clinics.PATIENT(S)All men referred for male infertility evaluation from 2002 to 2014 ( $n = 4,440$ ).INTERVENTION(S)None.MAIN OUTCOME MEASURE(S)Collected reproductive parameters included hormonal (gonadotropins, T, E2, PRL) and semen analysis (ejaculate volume, sperm concentration, motility, normal morphology) data. Body mass index (BMI) was calculated for all patients with comparisons to reproductive parameters using univariate and multiparametric models.RESULT(S)Based on World Health Organization definitions, 30.9% of the cohort was normal weight (BMI 18.5-24.9), 45.1% overweight (25-29.9), and 23.3% obese (>30). Neither FSH nor LH demonstrated significant correlations with BMI on multivariate analysis. Total T ( $r = -0.27$ ) and the T:E2 ratio ( $r = -0.29$ ) inversely varied with BMI, whereas E2 ( $r = 0.13$ ) had a direct correlation. On univariate analyses, BMI had weak but significant negative correlations with ejaculate volume ( $r = -0.04$ ), sperm concentration ( $r = -0.08$ ), motility ( $r = -0.07$ ), and morphology ( $r =$

-0.04). All parameters remained significant on multivariate modeling with the exception of sperm motility. Rates of azoospermia and oligospermia were also more prevalent among obese (12.7% and 31.7%, respectively) compared with normal weight men (9.8% and 24.5%).**CONCLUSION(S)**In one of the largest cohorts of male fertility and obesity, serum hormone and semen parameters demonstrated mild but significant relationships with BMI, possibly contributing to subfertility in this population.

**Database:** Medline

## **20. Effects of female and male body mass indices on the treatment outcomes and neonatal birth weights associated with in vitro fertilization/intracytoplasmic sperm injection treatment in China.**

**Author(s):** Wang, Xiaodan; Hao, Jiayuan; Zhang, Fuli; Li, Jing; Kong, Huijuan; Guo, Yihong

**Source:** Fertility and sterility; Aug 2016; vol. 106 (no. 2); p. 460-466

**Publication Date:** Aug 2016

**Publication Type(s):** Comparative Study Journal Article

**PubMedID:** 27155105

Available at [Fertility and sterility](#) - from Unpaywall

**Abstract:****OBJECTIVE**To investigate the combined effects of Chinese couples' body mass indices (BMIs) on the outcomes of IVF or intracytoplasmic sperm injection (ICSI) and the clinical characteristics of their neonates.**DESIGN**Retrospective cohort study.**SETTING**University-affiliated reproductive medicine center.**PATIENT(S)**A total of 12,061 first fresh IVF/ICSI cycles with autologous oocytes from September 1, 2009 to December 31, 2014.**INTERVENTION(S)**None.**MAIN OUTCOME MEASURE(S)**The primary treatment outcome was live birth, and the primary outcome for the neonates was neonatal birth weight (NBW).**RESULT(S)**After adjusting for confounders, our study showed that in IVF cycles, couples with a female BMI  $\geq 25$  kg/m<sup>2</sup> had a significantly higher odds of abortion and a significantly lower odds of live birth than couples with both male and female BMIs  $< 25$  kg/m<sup>2</sup>. Regarding ICSI cycles, no significant relationship was found between the couples' BMIs and the live birth rate. The NBWs of singletons conceived via IVF/ICSI cycles was significantly higher when their parents' BMIs were greater; however, no significant differences were observed in the NBWs of twins conceived via IVF/ICSI cycles.**CONCLUSION(S)**Increased female BMI negatively affected live births conceived via IVF. Regarding ICSI, no significant differences were found in the outcomes in terms of parental BMI. The singleton neonates' NBWs increased with parental BMI conceived via IVF/ICSI. However, parental BMI did not significantly affect the NBWs of twins conceived via IVF/ICSI.

**Database:** Medline

## **21. Effect of male body mass index on clinical outcomes following assisted reproductive technology: a meta-analysis.**

**Author(s):** Le, W; Su, S-H; Shi, L-H; Zhang, J-F; Wu, D-L

**Source:** Andrologia; May 2016; vol. 48 (no. 4); p. 406-424

**Publication Date:** May 2016

**Publication Type(s):** Meta-analysis Journal Article

**PubMedID:** 26276351

Available at [Andrologia](#) - from Wiley Online Library

**Abstract:**Overweight and obese males might exhibit a great risk of infertility. However, according to the current studies, the association between elevated male body mass index (BMI) and the clinical adverse results after assisted reproductive technology (ART) remains controversial. Hence, we conducted a meta-analysis to evaluate the effects of raised male BMI on clinical outcomes following ART. PubMed, EMBASE and three Chinese databases were used to identify relevant studies. The primary outcome was clinical pregnancy rate. Secondary outcomes included live birth rate and sperm parameters. A total of 5262 male participants from 10 cohort studies were subjected to meta-analysis. Results indicated that overweight or obese had no significant impact on clinical pregnancy rate [in vitro fertilisation (IVF): odds ratio (OR), 0.73; 95% confidence interval (CI), 0.39-1.39; intracytoplasmic sperm injection (ICSI): OR, 1.03; 95% CI, 0.92-1.15], live birth rate (IVF: OR, 0.91; 95% CI, 0.78-1.06; ICSI: OR, 1.00; 95% CI, 0.50-1.99) and sperm concentration (SMD, -0.28; 95% CI, -0.65 to 0.08) compared with normal weight following IVF/ICSI treatments. Exclusion of any single study and almost all the sensitivity analyses showed that our results were reliable. At present, the role of male BMI in the process of ART is only partly understood and should be further investigated.

**Database:** Medline

## **22. A link between hypothyroidism, obesity and male reproduction**

**Author(s):** Aiceles V.; Da Fonte Ramos C.

**Source:** Hormone Molecular Biology and Clinical Investigation; Jan 2016; vol. 25 (no. 1); p. 5-13

**Publication Date:** Jan 2016

**Publication Type(s):** Review

**PubMedID:** 26953711

**Abstract:**Hypothyroidism is a condition in which the serum levels of thyroid hormones are below that necessary to carry out physiological functions in the body. Hypothyroidism is related to obesity as an increase in body weight gain is seen in hypothyroid patients. Moreover, an inverse correlation between free thyroxine values and body mass index has been reported. Leptin, a polypeptide hormone produced by adipocytes, was originally thought to be an antiobesity hormone due its anorexic effects on hypothalamic appetite regulation. However, nowadays it is known that leptin conveys information about the nutritional status to the brain being considered a crucial endocrine factor for regulating several physiological processes including reproduction. Since the identification of thyroid hormone and leptin receptors on the testes, these hormones are being recognized as having important roles in male reproductive functions. A clear link exists among thyroid hormones, leptin and reproduction. Both hormones can negatively affect spermatogenesis and consequently may cause male infertility. The World Health Organization (WHO) estimates the overall prevalence of primary infertility ranging from 8 to 15%. The fact that 30% of couples' inability to conceive is related to a male factor and that the longer hypothyroidism persisted, the greater the damage to the testes, strongly suggest that more studies attempting to clarify both hormones actions directly in the testes need to be conducted specially in cases of congenital hypothyroidism. Therefore, the goal of



this review is to highlight the relationship of such hormones in the reproductive system. Copyright © 2016 by De Gruyter.

**Database:** EMBASE

### **23. The impact of obesity on male fertility.**

**Author(s):** Chambers, Thomas J G; Richard, Richard A

**Source:** Hormones (Athens, Greece); 2015; vol. 14 (no. 4); p. 563-568

**Publication Date:** 2015

**Publication Type(s):** Journal Article Review

**PubMedID:** 26732149

Available at [Hormones \(Athens, Greece\)](#) - from SpringerLink - Medicine

**Abstract:** Obesity in men of reproductive age is globally on the increase. There is clear evidence from epidemiological studies that obesity impacts negatively on male fertility; it is associated with hypogonadism, although it is less consistently linked to impaired spermatogenesis and tests of sperm function, including DNA fragmentation. Sperm from obese men used for in vitro fertilisation/intra cytoplasmic sperm injection is associated with a greater number of pregnancy losses and is less likely to result in live births. There are also increasing data from animal studies that paternal obesity may impact negatively on the reproductive and metabolic health of offspring and grand-offspring. It has been suggested that high-fat dietary exposures could affect the epigenetic content of sperm or the endocrine content of seminal fluid and thus impact early fetal development. Experimental and epidemiological data show that male fertility, and offspring health, can be improved by weight loss in obese and overweight males.

**Database:** Medline

## **24. Mechanisms linking obesity to male infertility.**

**Author(s):** Katib, Atif

**Source:** Central European journal of urology; 2015; vol. 68 (no. 1); p. 79-85

**Publication Date:** 2015

**Publication Type(s):** Journal Article Review

**PubMedID:** 25914843

Available at [Central European journal of urology](#) - from Europe PubMed Central - Open Access

Available at [Central European journal of urology](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [Central European journal of urology](#) - from Unpaywall

**Abstract:**INTRODUCTIONObesity in men is associated with infertility in numerous studies. The current trend for decline in semen parameters parallels the increasing prevalence of obesity worldwide. In addition to impaired semen quality, fertility among obese men may be affected by sexual dysfunction, endocrinopathy, aromatization activity, psychological and thermal effects, sleep apnea, leptin and minor toxins, and possibly the inflammatory and obstructive elements of epididymitis pathology. The variable degrees of certainty associated with these causes parallel the levels of supporting evidence. This search aims to shed lights on different conditions that obese men suffer from; as that makes the treatment of infertility more categorized.MATERIAL AND METHODSA PubMed search was conducted to identify clinical and pathological mechanisms linking obesity to male infertility.RESULTSAmong the myriad of publications reviewed in this paper, impaired spermatogenesis and sexual dysfunction have been shown to drive other variables towards poor fertility potentials. The paper presented a new, detailed flow chart showing more factors and further interactions among conditions leading to infertility.CONCLUSIONSThe prime hormonal defect in obese men is hypotestosteronaemia, which results in impaired spermatogenesis leading to poor fecundability. Studies have shown that most mechanisms accounting for reduced fertility potentials in overweight men are reversible.

**Database:** Medline

## **25. Male obesity and subfertility, is it really about increased adiposity?**

**Author(s):** McPherson, Nicole O; Lane, Michelle

**Source:** Asian journal of andrology; 2015; vol. 17 (no. 3); p. 450-458

**Publication Date:** 2015

**Publication Type(s):** Journal Article Review

**PubMedID:** 25652636

Available at [Asian journal of andrology](#) - from Europe PubMed Central - Open Access

Available at [Asian journal of andrology](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [Asian journal of andrology](#) - from Unpaywall

**Abstract:**The prevalence of overweight and obesity in reproductive-aged men is increasing worldwide, with >70% of men >18 years classified as overweight or obese in some western nations. Male obesity is associated with male subfertility, impairing sex hormones, reducing sperm counts, increasing oxidative sperm DNA damage and changing the epigenetic status of sperm. These changes to sperm function as a result of obesity, are further associated with impaired embryo development, reduced live birth rates and increased miscarriage rates in humans. Animal models have suggested that these adverse reproductive effects can be transmitted to the offspring; suggesting that men's health at conception may affect the health of their children. In addition to higher adiposity, male obesity is associated with comorbidities, including metabolic syndrome, hypercholesterolemia, hyperleptinemia and a pro-inflammatory state, all which have independently been linked with male subfertility. Taken together, these findings suggest that the effects of male obesity on fertility are likely multifactorial, with associated comorbidities also influencing sperm, pregnancy and subsequent child health.

**Database:** Medline

**26. Body mass index, waist-to-hip ratio, waist circumference and waist-to-height ratio cannot predict male semen quality: a report of 1231 subfertile Chinese men.**

**Author(s):** Lu, J-C; Jing, J; Dai, J-Y; Zhao, A Z; Yao, Q; Fan, K; Wang, G-H; Liang, Y-J; Chen, L; Ge, Y-F; Yao, B

**Source:** Andrologia; Nov 2015; vol. 47 (no. 9); p. 1047-1054

**Publication Date:** Nov 2015

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 25418484

Available at [Andrologia](#) - from Wiley Online Library

**Abstract:**There were controversial results between obesity-associated markers and semen quality. In this study, we investigated the correlations between age, obesity-associated markers including body mass index (BMI), waist-to-hip ratio (WHR), waist-to-height ratio (WHtR) and waist circumference (WC), the combination of age and obesity-associated markers, semen parameters and serum reproductive hormone levels in 1231 subfertile men. The results showed that BMI, WC, WHR and WHtR were positively related to age, and there were also positive relations between BMI, WHR, WC and WHtR and between sperm concentration (SC), total sperm count (TSC), progressive motility (PR), sperm motility and per cent of normal sperm morphology (NSM). However, age, each of obesity-associated markers and the combination of obesity-associated markers and age were unrelated to any of semen parameters including total normal-progressively motile sperm count (TNPMS). Age, BMI, WHR, WC and WHtR were negatively related to serum testosterone and SHBG levels. However, only serum LH and FSH levels were negatively related to sperm concentration, NSM and sperm motility. In a conclusion, although age and obesity have significant impacts on reproductive hormones such as testosterone, SHBG and oestradiol, semen parameters related to FSH and LH could not be influenced, indicating that obesity-associated markers could not predict male semen quality.

**Database:** Medline

**27. Paternal obesity negatively affects male fertility and assisted reproduction outcomes: A systematic review and meta-analysis**

**Author(s):** Campbell J.M.; Lane M.; Owens J.A.; Bakos H.W.

**Source:** Reproductive BioMedicine Online; Nov 2015; vol. 31 (no. 5); p. 593-604

**Publication Date:** Nov 2015

**Publication Type(s):** Review

**PubMedID:** 26380863

Available at [Reproductive biomedicine online](#) - from Unpaywall

**Abstract:**This systematic review investigated the effect of paternal obesity on reproductive potential. Databases searched were Pubmed, Ovid, Web of Science, Scopus, Cinahl and Embase. Papers were critically appraised by two reviewers, and data were extracted using a standardized tool. Outcomes were: likelihood of infertility, embryo development, clinical pregnancy, live birth, pregnancy viability, infant development, sperm; concentration, morphology, motility, volume, DNA fragmentation, chromatin condensation, mitochondrial membrane potential (MMP), and seminal plasma factors. Thirty papers were included, with a total participant number of 115,158. Obese men were more likely to experience infertility (OR = 1.66, 95% CI 1.53-1.79), their rate of live birth per cycle of assisted reproduction technology (ART) was reduced (OR = 0.65, 95% CI 0.44-0.97) and they had a 10% absolute risk increase of pregnancy non-viability. Additionally, obese men had an increased percentage of sperm with low MMP, DNA fragmentation, and abnormal morphology.

Clinically significant differences were not found for conventional semen parameters. From these findings it can be concluded that male obesity is associated with reduced reproductive potential. Furthermore, it may be informative to incorporate DNA fragmentation analysis and MMP assessment into semen testing, especially for obese men whose results suggest they should have normal fertility. Copyright © 2015 Reproductive Healthcare Ltd.

**Database:** EMBASE

## **28. How does obesity affect fertility in men - and what are the treatment options?**

**Author(s):** Stokes, Victoria J; Anderson, Richard A; George, Jyothis T

**Source:** Clinical endocrinology; May 2015; vol. 82 (no. 5); p. 633-638

**Publication Date:** May 2015

**Publication Type(s):** Journal Article

**PubMedID:** 25138694

Available at [Clinical endocrinology](#) - from Wiley Online Library

**Abstract:** Adiposity is associated with reduced fertility in men. The aetiology is multifactorial, with obese men at greater risk of suffering from impaired spermatogenesis, reduced circulating testosterone levels, erectile dysfunction and poor libido. The diagnosis and treatment of reduced fertility observed in obese men therefore requires insight into the underlying pathology, which has hormonal, mechanical and psychosocial aspects. This article summarises the current epidemiological, experimental and clinical trial evidence from the perspective of a practicing clinician. The following conclusions and recommendations can be drawn: Obesity is associated with low serum testosterone concentrations, but treatment with exogenous testosterone is likely to adversely impact on fertility. It is important to discuss this with men prior to initiation of testosterone therapy. Obesity adversely affects sperm concentration and may affect sperm quality. However, whether or not weight loss will correct these factors remain to be established. Oestrogen receptor modulators (and aromatase inhibitors) are unlicensed in the treatment for male hypogonadism and/or infertility. These treatments should hence be considered experimental approach until ongoing clinical trials report their outcomes.

**Database:** Medline

## 29. No association between body mass index and sperm DNA integrity

**Author(s):** Bandel I.; Bungum M.; Axelsson J.; Giwercman A.; Richtoff J.; Malm G.; Malm J.; Pedersen H.S.; Ludwicki J.K.; Czaja K.; Hernik A.; Toft G.; Bonde J.P.; Spano M.; Haugen T.B.

**Source:** Human Reproduction; Feb 2015; vol. 30 (no. 7); p. 1704-1713

**Publication Date:** Feb 2015

**Publication Type(s):** Article

**PubMedID:** 25994665

Available at [Human reproduction \(Oxford, England\)](#) - from Oxford Journals - Medicine

Available at [Human reproduction \(Oxford, England\)](#) - from HighWire - Free Full Text

Available at [Human reproduction \(Oxford, England\)](#) - from Unpaywall

**Abstract:**STUDY QUESTION Is overweight associated with impaired sperm DNA integrity? SUMMARY ANSWER High body mass index (BMI) is not associated with impaired sperm DNA integrity as assessed by the DNA Fragmentation Index (DFI). WHAT IS KNOWN ALREADY Previous studies, based on fewer subjects and including mainly subfertile men, have shown conflicting results regarding the influence of overweight and obesity on sperm DNA integrity. STUDY DESIGN, SIZE, DURATION This cross-sectional study was based on semen samples from 1503 men from the general population. PARTICIPANTS/MATERIALS, SETTING, METHODS We included two cohorts (cohort A and B) of military recruits (n = 275, n = 304, respectively), one group (cohort C) of fertile men and men without known fertility problems (n = 724), and one group (cohort D) of men between 19 and 40 years without known fertility problems (n = 200). In all cohorts, data were available on BMI, DFI as measured by the sperm chromatin structure assay (SCSA), standard semen characteristics, and potential confounders (age, abstinence time, smoking habits). The subjects were categorized according to BMI into four groups: underweight (<18.5 kg/m<sup>2</sup>), normal weight (18.5-24.9 kg/m<sup>2</sup>), overweight (25.0-29.9 kg/m<sup>2</sup>) and obese (≥30.0 kg/m<sup>2</sup>). Using a linear regression model, the inter-group differences in DFI were calculated. Furthermore with the normal-weight group as the reference, the odds ratios (ORs) for DFI > 20% and DFI > 30%, were calculated for the other groups. Calculations were made for the material as a whole and after exclusion of cohort C which included proven fertile men. MAIN RESULTS AND THE ROLE OF CHANCE We found that normal-weight men had significantly higher DFI than overweight men, with a mean difference of 1.13% (95% CI: 1.05-1.22%); P = 0.001). Overweight men had a reduced risk of having DFI ≥ 20% and DFI ≥ 30%, compared with normal-weight men; adjusted odds ratio (OR) = 0.61 (95% CI: 0.42-0.88; P < 0.01) and adjusted OR = 0.48 (95% CI: 0.28-0.84; P < 0.01), respectively. When excluding cohort C, the statistical significance was lost. Regarding standard semen parameters, we found that obese men had a higher percentage of progressive motile spermatozoa than normal-weight men; mean difference 1.15% (95% CI: 1.02-1.30%, P < 0.05) but the significance was lost when excluding cohort C. All other standard semen parameters were unaffected by BMI. LIMITATIONS, REASONS FOR CAUTION A main limitation might be the cross-sectional nature of the data. Furthermore our study included a significant proportion of men with proven fertility (75% of cohort C, n = 550), and could therefore be biased toward fertility. WIDER IMPLICATIONS OF THE FINDINGS Our study indicates that overweight per se is not associated with a higher level of sperm DNA damage. STUDY FUNDING/COMPETING INTEREST(S) This research has been given grants from the following: EU 5th and 7th framework program (Inuendo and Clear projects, [Contracts no. QLK4-CT-2001-00202 and FP7-ENV-2008-1-226217]), the Swedish Research Council (Grants No. 2007-2590, 521-2004-6072 and 521-2002-3907); the Swedish Governmental Funding for Clinical Research, Skane county council's research and development foundation, MAS Funds, University Hospital MAS Foundation in Malmo, Crafoordska Fund, Ove Tulefjords Fund, Foundation for Urological Research, Fundacion Federico SA, and Gunnar Nilssons Cancer Fund. The authors declare that there are no conflicts of interest. Copyright © 2015 The Author.

**Database:** EMBASE

### **30. Recent scenario of obesity and male fertility**

**Author(s):** Shukla K.K.; Chambial S.; Dwivedi S.; Sharma P.; Misra S.

**Source:** Andrology; 2014

**Publication Date:** 2014

**Publication Type(s):** Article In Press

**PubMedID:** 25269421

Available at [Andrology](#) - from Wiley Online Library

**Abstract:**The aim of this review was to provide current scenario linking obesity and male fertility. Obesity has been linked to male fertility because of lifestyle changes, internal hormonal environment alterations, and sperm genetic factors. A few studies assessing the impact of obesity on sperm genetic factor have been published, but they did not lead to a strong consensus. Our objective was to explore further the relationship between sperm genetic factor and obesity. There are emerging facts that obesity negatively affects male reproductive potential not only by reducing sperm quality, but in particular it alters the physical and molecular structure of germ cells in the testes and ultimately affects the maturity and function of sperm cells. Inhibition of microRNA in the male pronucleus of fertilized zygotes produces offspring of phenotypes of variable severity depending on miRNAs ratios. Hence, these RNAs have a role in the oocyte development during fertilization and in embryo development, fetal survival, and offspring phenotype. It has been reported that the miRNA profile is altered in spermatozoa of obese males, however, the impact of these changes in fertilization and embryo health remains as yet not known. Copyright © 2014 American Society of Andrology and European Academy of Andrology.

**Database:** EMBASE



**31. High body mass index has a deleterious effect on semen parameters except morphology: results from a large cohort study.**

**Author(s):** Belloc, Stéphanie; Cohen-Bacrie, Martine; Amar, Edouard; Izard, Vincent; Benkhalifa, Moncef; Dalléac, Alain; de Mouzon, Jacques

**Source:** Fertility and sterility; Nov 2014; vol. 102 (no. 5); p. 1268-1273

**Publication Date:** Nov 2014

**Publication Type(s):** Journal Article

**PubMedID:** 25225071

**Abstract:**OBJECTIVETo evaluate the influence of body mass index (BMI) on semen characteristics.DESIGNCohort study.SETTINGSingle private andrology laboratory.PATIENT(S)All patients (n=10,665) consulting for a semen analysis from October 9, 2010, to October 8, 2011. When analyses were repeated on the same patient, only the first was included.INTERVENTION(S)Recording of self-reported weight and height and of semen analysis.MAIN OUTCOME MEASURE(S)All parameters of standard semen analysis: pH, volume, sperm concentration per mL, total sperm count per ejaculate, motility (%) within 1 hour after ejaculation (overall and progressive), viability (%), and normal sperm morphology (%). Parametric and nonparametric statistical methods were applied, and results are given either with mean±SD, or 10th, 50th, and 90th percentiles.RESULT(S)Semen volume decreased from 3.3±1.6 to 2.7±1.6 mL when BMI increased from normal (20-25 kg/m<sup>2</sup>) to extreme obesity (>40 kg/m<sup>2</sup>). The same was true for semen concentration (56.4±54.9 to 39.4±51.0 million/mL), total sperm count (171±170 to 92±95 million), and progressive motility (36.9±16.8% to 34.7±17.1%). The percentage of cases with azoospermia and cryptozoospermia increased from 1.9% to 9.1% and from 4.7% to 15.2%, respectively. The other semen characteristics were not affected. Multivariate models including age and abstinence duration confirmed these results.CONCLUSION(S)In this study, on a large patient sample size, increased BMI was associated with decreased semen quality, affecting volume, concentration, and motility. The percentage of normal forms was not decreased.

**Database:** Medline

**32. The relationship between male BMI and waist circumference on semen quality: data from the LIFE study.**

**Author(s):** Eisenberg, Michael L; Kim, Sungduk; Chen, Zhen; Sundaram, Rajeshwari; Schisterman, Enrique F; Buck Louis, Germaine M

**Source:** Human reproduction (Oxford, England); Feb 2014; vol. 29 (no. 2); p. 193-200

**Publication Date:** Feb 2014

**Publication Type(s):** Research Support, N.i.h., Intramural Journal Article

**PubMedID:** 24306102

Available at [Human reproduction \(Oxford, England\)](#) - from Oxford Journals - Medicine

Available at [Human reproduction \(Oxford, England\)](#) - from HighWire - Free Full Text

Available at [Human reproduction \(Oxford, England\)](#) - from Unpaywall

**Abstract:**STUDY QUESTIONWhat is the relationship between body size, physical activity and semen parameters among male partners of couples attempting to become pregnant?SUMMARY ANSWEROverweight and obesity are associated with a higher prevalence of low ejaculate volume, sperm concentration and total sperm count.WHAT IS KNOWN ALREADYHigher BMI is associated with impaired semen parameters, while increasing waist circumference (WC) is also associated with impaired semen parameters in infertile men.STUDY DESIGN, SIZE, DURATIONData from the Longitudinal Investigation of Fertility and the Environment (LIFE) Study were utilized. The LIFE study

is a population-based prospective cohort of 501 couples attempting to conceive in two geographic areas (Texas and Michigan, USA) recruited in 2005-2009. Couples were recruited from four counties in Michigan and 12 counties in Texas to ensure a range of environmental exposures and lifestyle characteristics. In person interviews were conducted to ascertain demographic, health and reproductive histories followed by anthropometric assessment. PARTICIPANTS/MATERIALS, SETTING, METHODS We categorized BMI (kg/m<sup>2</sup>) as <25.0 (underweight and normal), 25.0-29.9 (overweight) 30.0-34.9 (obese, class I) and ≥35 (obese, class II) for analysis. Data were available for analysis in 468 men (93% participation), with a mean ± SD age of 31.8 ± 4.8 years, BMI of 29.8 ± 5.6 kg/m<sup>2</sup> and WC of 100.8 ± 14.2 cm. The majority of the cohort (82%) was overweight or obese with 58% reporting physical activity <1 time/week. The median sperm concentration for the men in the cohort was 60.2 M/ml with 8.6% having oligospermia (<15 M/ml). MAIN RESULTS AND THE ROLE OF CHANCE When examining semen parameters, ejaculate volume showed a linear decline with increasing BMI and WC (P < 0.01). Similarly, the total sperm count showed a negative linear association with WC (P < 0.01). No significant relationship was seen between body size (i.e. BMI or WC) and semen concentration, motility, vitality, morphology or DNA fragmentation index. The percentage of men with abnormal volume, concentration and total sperm increased with increasing body size (P < 0.05). No relationship between physical activity and semen parameters was identified. LIMITATIONS, REASONS FOR CAUTION Our cohort was largely overweight and sedentary, which may result in limited external validity, i.e. generalizability. The lack of physical activity did preclude examination of exercise more frequently than once per week, thus our ability to examine more active individuals is limited. WIDER IMPLICATIONS OF THE FINDINGS Body size (as measured by BMI or WC) is negatively associated with semen parameters with little influence of physical activity. Our findings are the first showing a relationship between WC and semen parameters in a sample of men without known infertility. Given the worldwide obesity epidemic, further study of the role of weight loss to improve semen parameters is warranted. STUDY FUNDING/COMPETING INTEREST(S) Supported by the Intramural Research Program of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (Contracts #N01-HD-3-3355, N01-HD-3-3356 and N01-HD-3-3358). There are no competing interests.

**Database:** Medline

### **33. BMI in relation to sperm count: an updated systematic review and collaborative meta-analysis.**

**Author(s):** Sermondade, N; Faure, C; Fezeu, L; Shayeb, A G; Bonde, J P; Jensen, T K; Van Wely, M; Cao, J; Martini, A C; Eskandar, M; Chavarro, J E; Koloszar, S; Twigt, J M; Ramlau-Hansen, C H; Borges, E; Lotti, F; Steegers-Theunissen, R P M; Zorn, B; Polotsky, A J; La Vignera, S; Eskenazi, B; Tremellen, K; Magnusdottir, E V; Fejes, I; Hercberg, S; Lévy, R; Czernichow, S

**Source:** Human reproduction update; 2013; vol. 19 (no. 3); p. 221-231

**Publication Date:** 2013

**Publication Type(s):** Research Support, N.i.h., Extramural Meta-analysis Journal Article Review Systematic Review

**PubMedID:** 23242914

Available at [Human reproduction update](#) - from Oxford Journals - Medicine

Available at [Human reproduction update](#) - from HighWire - Free Full Text

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**Abstract:**BACKGROUND The global obesity epidemic has paralleled a decrease in semen quality. Yet, the association between obesity and sperm parameters remains controversial. The purpose of this report was to update the evidence on the association between BMI and sperm count through a systematic review with meta-analysis. METHODS A systematic review of available literature (with no language restriction) was performed to investigate the impact of BMI on sperm count. Relevant studies published until June 2012 were identified from a Pubmed and EMBASE search. We also included unpublished data (n = 717 men) obtained from the Infertility Center of Bondy, France. Abstracts of relevant articles were examined and studies that could be included in this review were retrieved. Authors of relevant studies for the meta-analysis were contacted by email and asked to provide standardized data. RESULTS A total of 21 studies were included in the meta-analysis, resulting in a sample of 13 077 men from the general population and attending fertility clinics. Data were stratified according to the total sperm count as normozoospermia, oligozoospermia and azoospermia. Standardized weighted mean differences in sperm concentration did not differ significantly across BMI categories. There was a J-shaped relationship between BMI categories and risk of oligozoospermia or azoospermia. Compared with men of normal weight, the odds ratio (95% confidence interval) for oligozoospermia or azoospermia was 1.15 (0.93-1.43) for underweight, 1.11 (1.01-1.21) for overweight, 1.28 (1.06-1.55) for obese and 2.04 (1.59-2.62) for morbidly obese men. CONCLUSIONS Overweight and obesity were associated with an increased prevalence of azoospermia or oligozoospermia. The main limitation of this report is that studied populations varied, with men recruited from both the general population and infertile couples. Whether weight normalization could improve sperm parameters should be evaluated further.

**Database:** Medline

### **34. The impact of obesity on male reproduction: Its biological significance**

**Author(s):** Martini A.C.; Ruiz R.D.; Cuneo M.F.D.; Molina R.I.; Tissera A.

**Source:** Expert Review of Endocrinology and Metabolism; 2013; vol. 8 (no. 2); p. 139-148

**Publication Date:** 2013

**Publication Type(s):** Review

Available at [Expert Review of Endocrinology & Metabolism](#) - from ProQuest (Health Research Premium) - NHS Version

**Abstract:** Since obesity and male subfertility have increased in parallel during the last decades, the hypothesis of an association between these two phenomena has been explored by several researchers. Although there is no consensus apparently obesity impacts men's reproductive potential by several mechanisms, like alterations on the hypothalamus-pituitary-testicular axis, modifications of spermatogenesis and semen quality and/or impairment of men's sexual health. This review intends to summarize the underlying bases of such alterations and propose new ones, without miscalculating their biological significance. Obesity is not rigorously related to subfertility; in addition, the existence of a genetic predisposition to obesity-linked sterility is currently under investigation. Nonetheless, the impact of obesity on male reproductive potential must be fully elucidated since the prevalence of obesity is increasing and consequently, the number of obese men with reduced fertility will also rise. © 2013 Expert Reviews Ltd.

**Database:** EMBASE

### **35. Body mass index is not associated with sperm-zona pellucida binding ability in subfertile males.**

**Author(s):** Sermondade, Nathalie; Dupont, Charlotte; Faure, Céline; Boubaya, Marouane; Cédric-Durnerin, Isabelle; Chavatte-Palmer, Pascale; Sifer, Christophe; Lévy, Rachel

**Source:** Asian journal of andrology; Sep 2013; vol. 15 (no. 5); p. 626-629

**Publication Date:** Sep 2013

**Publication Type(s):** Journal Article Observational Study

**PubMedID:** 23770940

Available at [Asian journal of andrology](#) - from Europe PubMed Central - Open Access

Available at [Asian journal of andrology](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [Asian journal of andrology](#) - from Unpaywall

**Abstract:** Lifestyle factors, such as weight and nutritional status may affect male fertility, including sperm fertilization ability. The objective of this retrospective study was to evaluate the association between body mass index (BMI) and sperm-zona pellucida binding ability assessed according to the zona binding (ZB) test, which has been described to be a relevant diagnostic tool for the prediction of in vitro fertilization (IVF) ability. Three hundred and six male patients from couples diagnosed with primary idiopathic or mild male factor infertility were included. Correlations between BMI and semen parameters according to ZB test indices were assessed, together with frequencies of positive and negative tests across the BMI categories. In this selected population, BMI was not related to conventional semen parameters or sperm quality assessed according to the ability of spermatozoa to bind to the zona pellucida. The previously described poor outcomes of IVF procedures in cases of male obesity could be due to other sperm defects, such as alterations of sperm capacitation or acrosome reaction. The link between male BMI and biological outcomes during IVF procedures, such as fertilization rates, should be further evaluated.

**Database:** Medline

### **36. Impact of obesity on male fertility, sperm function and molecular composition.**

**Author(s):** Palmer, Nicole O; Bakos, Hassan W; Fullston, Tod; Lane, Michelle

**Source:** Spermatogenesis; Oct 2012; vol. 2 (no. 4); p. 253-263

**Publication Date:** Oct 2012

**Publication Type(s):** Journal Article

**PubMedID:** 23248766

Available at [Spermatogenesis](#) - from Europe PubMed Central - Open Access

Available at [Spermatogenesis](#) - from PubMed

Available at [Spermatogenesis](#) - from Unpaywall

**Abstract:**Male obesity in reproductive-age men has nearly tripled in the past 30 y and coincides with an increase in male infertility worldwide. There is now emerging evidence that male obesity impacts negatively on male reproductive potential not only reducing sperm quality, but in particular altering the physical and molecular structure of germ cells in the testes and ultimately mature sperm. Recent data has shown that male obesity also impairs offspring metabolic and reproductive health suggesting that paternal health cues are transmitted to the next generation with the mediator mostly likely occurring via the sperm. Interestingly the molecular profile of germ cells in the testes and sperm from obese males is altered with changes to epigenetic modifiers. The increasing prevalence of male obesity calls for better public health awareness at the time of conception, with a better understanding of the molecular mechanism involved during spermatogenesis required along with the potential of interventions in reversing these deleterious effects. This review will focus on how male obesity affects fertility and sperm quality with a focus on proposed mechanisms and the potential reversibility of these adverse effects.

**Database:** Medline

### **37. Body mass index and central adiposity are associated with sperm quality in men of subfertile couples.**

**Author(s):** Hammiche, Fatima; Laven, Joop S E; Twigt, John M; Boellaard, Willem P A; Steegers, Eric A P; Steegers-Theunissen, Régine P

**Source:** Human reproduction (Oxford, England); Aug 2012; vol. 27 (no. 8); p. 2365-2372

**Publication Date:** Aug 2012

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 22693175

Available at [Human reproduction \(Oxford, England\)](#) - from Oxford Journals - Medicine

Available at [Human reproduction \(Oxford, England\)](#) - from HighWire - Free Full Text

Available at [Human reproduction \(Oxford, England\)](#) - from Unpaywall

**Abstract:**BACKGROUNDThe incidence of overweight and obesity in men of reproductive ages is rising, which may affect fertility. Therefore, this study aims to assess the associations between BMI, central adiposity and sperm parameters in men of subfertile couples.METHODSEjaculate volume (ml), sperm concentration (millions per ml), percentage of progressive motile and immotile spermatozoa and total motile sperm count (millions) were measured in 450 men of subfertile couples visiting a tertiary outpatient clinic for reproductive treatment and preconception counseling.RESULTSOverweight was negatively associated with the percentage of progressive motility type A [ $\beta$  -0.32 (SE 0.2),  $P=0.036$ ] and positively associated with the percentage of immotility

type C [ $\beta$  0.21 (SE 0.07),  $P=0.002$ ]. Obesity was negatively associated with ejaculate volume [ $\beta$ -0.23 (SE 0.1),  $P=0.02$ ], sperm concentration [ $\beta$  -0.77 (SE 0.3),  $P=0.006$ ] and total motile sperm count [ $\beta$  -0.91 (SE 0.3),  $P=0.007$ ]. Waist circumference  $\geq 102$  cm, a measure for central adiposity, was inversely associated with sperm concentration [ $\beta$  -0.69 (SE 0.2),  $P=0.001$ ] and total motile sperm count [ $\beta$ -0.62 (SE 0.3),  $P=0.02$ ]. All associations remained significant after adjustment for age, ethnicity, active and passive smoking, alcohol and medication use and folate status. **CONCLUSION** This study shows that in particular, sperm concentration and total motile sperm count in men of subfertile couples are detrimentally affected by a high BMI and central adiposity. The effect of weight loss on sperm quality and fertility needs further investigation.

**Database:** Medline

### **38. Male fertility, obesity, and bariatric surgery.**

**Author(s):** Reis, Leonardo Oliveira; Dias, Fernando Goulart Fernandes

**Source:** Reproductive sciences (Thousand Oaks, Calif.); Aug 2012; vol. 19 (no. 8); p. 778-785

**Publication Date:** Aug 2012

**Publication Type(s):** Journal Article Review

**PubMedID:** 22534334

**Abstract:** Obesity has become a new worldwide health problem with significant impact not only on cardiovascular diseases but also on many other related disorders, highlighting infertility. Obesity may adversely affect male reproduction by endocrinologic, thermal, genetic, and sexual mechanisms. There is good evidence that obesity can be associated with reduced sperm concentrations, but studies about sperm motility, morphology, and DNA fragmentation have been less numerous and more conflicting. Although weight loss is the cornerstone of the treatment of obesity-related infertility, with promising results in restoring fertility and normal hormonal profiles, bariatric surgery impact on male fertility is still unclear and until now there is not enough data to support the informed consent in this scenario. Physicians are encouraged to highlight possible positive and/or negative impacts concerning male capacity of fertilization when informing patients. A balanced judgment and a personalized case-by-case management with patient involvement in decisions are fundamental in this setting and indication of cryopreservation of semen samples should be considered in selected circumstances. Well-structured trials controlled for confounders including female factors and based on solid outcomes (ie, birth rates) must urgently come up to clarify this emerging scenario.

**Database:** Medline

### **39. The effect of body mass index on the outcomes of first assisted reproductive technology cycles.**

**Author(s):** Moragianni, Vasiliki A; Jones, Stephanie-Marie L; Ryley, David A

**Source:** Fertility and sterility; Jul 2012; vol. 98 (no. 1); p. 102-108

**Publication Date:** Jul 2012

**Publication Type(s):** Evaluation Study Journal Article

**PubMedID:** 22584023

**Abstract:**OBJECTIVETo provide assisted reproductive technology (ART) outcome rates per body mass index (BMI) category after controlling for potential confounders.DESIGNRetrospective cohort study.SETTINGLarge university-affiliated infertility practice.PATIENT(S)Women undergoing ART.INTERVENTION(S)None.MAIN OUTCOME MEASURE(S)The primary outcome was live birth. Analyses were stratified according to BMI category and adjusted for potential confounders, including maternal and paternal age, baseline serum FSH, duration of gonadotropin stimulation, mean daily gonadotropin dose, peak serum E(2), number of oocytes retrieved, use of intracytoplasmic sperm injection, embryo quality and number, transfer day, and number of embryos transferred.RESULT(S)We analyzed the first autologous fresh IVF or IVF-ICSI cycle of 4,609 patients. There were no differences in the rates of cycle cancellation, spontaneous abortion, biochemical and ectopic pregnancies, or multiple births. After adjusting for potential confounders, patients with BMI  $\geq 30.0$  kg/m<sup>2</sup> had significantly decreased odds of implantation, clinical pregnancy, and live birth. The adjusted odds ratio (95% confidence interval [CI]) of live birth were 0.63 (0.47-0.85) for BMI 30.00-34.99, 0.39 (0.25-0.61) for BMI 35.00-39.99, and 0.32 (0.16-0.64) for BMI  $\geq 40.0$  compared with normal-weight cohorts.CONCLUSION(S)Obesity has a significant negative effect on ART outcomes. Patients with BMI  $> 30$  kg/m<sup>2</sup> have up to 68% lower odds of having a live birth following their first ART cycle compared with women with BMI  $< 30$ .

**Database:** Medline

### **40. An exploration of the association between male body mass index and semen quality.**

**Author(s):** Shayeb, A G; Harrild, K; Mathers, E; Bhattacharya, S

**Source:** Reproductive biomedicine online; Dec 2011; vol. 23 (no. 6); p. 717-723

**Publication Date:** Dec 2011

**Publication Type(s):** Journal Article

**PubMedID:** 22019618

Available at [Reproductive biomedicine online](#) - from Unpaywall

**Abstract:**Obesity is becoming a serious problem, especially in industrialized societies. This study was designed to explore the association between body mass index (BMI) and semen quality. Semen analysis and demographic data were collected from male partners of couples undergoing fertility investigations in a referral fertility centre. Men were classified into groups according to their BMI (A,  $<18.5$ ; B, 18.5-24.99; C, 25-29.99; D,  $\geq 30$  kg/m<sup>2</sup>). Data from 2035 men were analysed using logistic regression. There were 18, 839, 909 and 269 men in groups A, B, C and D, respectively. Taking group B as the reference, adjusted odds ratios (95% CI) for groups A, C and D for semen volume  $<2$  ml were 1.57 (0.49-5.01), 1.06 (0.82-1.38) and 1.69 (1.20-2.38), respectively; for sperm morphology  $<15\%$ , 1.44 (0.45-4.61), 1.07 (0.86-1.33) and 1.50 (1.06-2.09); for sperm concentration  $<20$  million/ml, 0.46 (0.10-2.07), 1.03 (0.82-1.31) and 1.00 (0.72-1.41); and for motility  $<50\%$ , 2.62 (0.73-9.45), 0.96 (0.78-1.18) and 0.75 (0.56-1.01). In conclusion, obese men are more likely to have lower semen volume and fewer morphologically normal spermatozoa than men with normal BMI.

**Database:** Medline



**41. The impact of body mass index on semen parameters and reproductive hormones in human males: a systematic review with meta-analysis.**

**Author(s):** MacDonald, A A; Herbison, G P; Showell, M; Farquhar, C M

**Source:** Human reproduction update; 2010; vol. 16 (no. 3); p. 293-311

**Publication Date:** 2010

**Publication Type(s):** Research Support, Non-u.s. Gov't Meta-analysis Journal Article Review Systematic Review

**PubMedID:** 19889752

Available at [Human reproduction update](#) - from Oxford Journals - Medicine

Available at [Human reproduction update](#) - from HighWire - Free Full Text

Available at [Human reproduction update](#) - from Unpaywall

**Abstract:**BACKGROUNDIt has been suggested that body mass index (BMI), especially obesity, is associated with subfertility in men. Semen parameters are central to male fertility and reproductive hormones also play a role in spermatogenesis. This review aimed to investigate the association of BMI with semen parameters and reproductive hormones in men of reproductive age.METHODSMEDLINE, EMBASE, Biological Abstracts, PsycINFO and CINAHL databases and references from relevant articles were searched in January and February 2009. Outcomes included for semen parameters were sperm concentration, total sperm count, semen volume, motility and morphology. Reproductive hormones included were testosterone, free testosterone, estradiol, FSH, LH, inhibin B and sex hormone binding globulin (SHBG). A meta-analysis was conducted to investigate sperm concentration and total sperm count.RESULTSIn total, 31 studies were included. Five studies were suitable for pooling and the meta-analysis found no evidence for a relationship between BMI and sperm concentration or total sperm count. Overall review of all studies similarly revealed little evidence for a relationship with semen parameters and increased BMI. There was strong evidence of a negative relationship for testosterone, SHBG and free testosterone with increased BMI.CONCLUSIONSThis systematic review with meta-analysis has not found evidence of an association between increased BMI and semen parameters. The main limitation of this review is that data from most studies could not be aggregated for meta-analysis. Population-based studies with larger sample sizes and longitudinal studies are required.

**Database:** Medline

#### **42. Obesity: modern man's fertility nemesis.**

**Author(s):** Cabler, Stephanie; Agarwal, Ashok; Flint, Margot; du Plessis, Stefan S

**Source:** Asian journal of andrology; Jul 2010; vol. 12 (no. 4); p. 480-489

**Publication Date:** Jul 2010

**Publication Type(s):** Journal Article Review

**PubMedID:** 20531281

Available at [Asian journal of andrology](#) - from Europe PubMed Central - Open Access

Available at [Asian journal of andrology](#) - from ProQuest (Health Research Premium) - NHS Version

Available at [Asian journal of andrology](#) - from Unpaywall

**Abstract:**The obesity pandemic has grown to concerning proportions in recent years, not only in the Western World, but in developing countries as well. The corresponding decrease in male fertility and fecundity may be explained in parallel to obesity, and obesity should be considered as an etiology of male fertility. Studies show that obesity contributes to infertility by reducing semen quality, changing sperm proteomes, contributing to erectile dysfunction, and inducing other physical problems related to obesity. Mechanisms for explaining the effect of obesity on male infertility include abnormal reproductive hormone levels, an increased release of adipose-derived hormones and adipokines associated with obesity, and other physical problems including sleep apnea and increased scrotal temperatures. Recently, genetic factors and markers for an obesity-related infertility have been discovered and may explain the difference between fertile obese and infertile obese men. Treatments are available for not only infertility related to obesity, but also as a treatment for the other comorbidities arising from obesity. Natural weight loss, as well as bariatric surgery are options for obese patients and have shown promising results in restoring fertility and normal hormonal profiles. Therapeutic interventions including aromatase inhibitors, exogenous testosterone replacement therapy and maintenance and regulation of adipose-derived hormones, particularly leptin, may also be able to restore fertility in obese males. Because of the relative unawareness and lack of research in this area, controlled studies should be undertaken and more focus should be given to obesity as an etiology of male infertility.

**Database:** Medline

#### **43. The effect of obesity on sperm disorders and male infertility.**

**Author(s):** Du Plessis, Stefan S; Cabler, Stephanie; McAlister, Debra A; Sabanegh, Edmund; Agarwal, Ashok

**Source:** Nature reviews. Urology; Mar 2010; vol. 7 (no. 3); p. 153-161

**Publication Date:** Mar 2010

**Publication Type(s):** Journal Article Review

**PubMedID:** 20157305

Available at [Nature reviews. Urology](#) - from ProQuest (Health Research Premium) - NHS Version

**Abstract:**The results of several studies point to an increased likelihood of abnormal semen parameters among overweight men, and an elevated risk for subfertility among couples in which the male partner is obese. Obesity is, therefore, associated with a higher incidence of male factor infertility. Several mechanisms might account for the effect of obesity on male infertility, both directly and indirectly, by inducing sleep apnea, alterations in hormonal profiles (reduced inhibin B and androgen levels accompanied by elevated estrogen levels) and increased scrotal temperatures, ultimately manifesting as impaired semen parameters (decreased total sperm count, concentration and motility; increased DNA fragmentation index). Neither the reversibility of obesity-associated male infertility with weight loss nor effective therapeutic interventions have been studied in-depth. The increasing prevalence of obesity calls for greater clinical awareness of its effects on fertility, better understanding of underlying mechanisms, and exploration into avenues of treatment.

**Database:** Medline

#### **44. Mechanisms of obesity-induced male infertility.**

**Author(s):** Phillips, Karen P; Tanphaichitr, Nongnuj

**Source:** Expert review of endocrinology & metabolism; Mar 2010; vol. 5 (no. 2); p. 229-251

**Publication Date:** Mar 2010

**Publication Type(s):** Journal Article

**PubMedID:** 30764048

Available at [Expert review of endocrinology & metabolism](#) - from ProQuest (Health Research Premium) - NHS Version

**Abstract:**Male infertility, characterized by hypogonadism, decreased semen quality or ejaculatory dysfunction, accounts for approximately 20% of infertility cases. Obesity and metabolic dysfunction have been identified, among other causal factors, to contribute to male infertility. In the context of the Western world's 'obesity epidemic', this article discusses three main biological mechanisms linking obesity to impaired male reproductive function: hypogonadism, testicular heat stress/hypoxia-induced apoptosis and endocrine disruption by 'obesogens'. Among these, obesity-induced hypogonadism is undoubtedly the most clinically significant and is easily assessed. Rapidly expanding areas of research in this area include leptin modulation of kisspeptins and hypothalamic-pituitary-testicular hormone pathways, and roles of other adipocytokines in male infertility, as well as the impact of exposure to obesogens on the quality of semen.

**Database:** Medline

#### **45. Impact of male obesity on infertility: a critical review of the current literature**

**Author(s):** Hammoud A.O.; Gibson M.; Peterson C.M.; Carrell D.T.; Meikle A.W.

**Source:** Fertility and Sterility; Oct 2008; vol. 90 (no. 4); p. 897-904

**Publication Date:** Oct 2008

**Publication Type(s):** Review

**PubMedID:** 18929048

**Abstract:**Objective: To evaluate the current understanding of the effects and potential mechanisms of obesity on male fertility. Design(s): Literature review of articles pertaining to obesity and male infertility. Result(s): Recent population-based studies suggest an elevated risk for subfertility among couples in which the male partner is obese and an increased likelihood of abnormal semen parameters among heavier men. Male factor infertility is associated with a higher incidence of obesity in the male partner. Obese men exhibit reduced androgen and SHBG levels accompanied by elevated estrogen levels. Reduced inhibin B levels correlate with degree of obesity and are not accompanied by compensatory increases in FSH. This complexly altered reproductive hormonal profile suggests that endocrine dysregulation in obese men may explain the increased risk of altered semen parameters and infertility. Additional features of male obesity that may contribute to an increased risk for infertility are altered retention and metabolism of environmental toxins, altered lifestyle factors, and increased risks for sexual dysfunction. Neither reversibility of obesity-associated male infertility with weight loss nor effective therapeutic interventions have been studied yet. Conclusion(s): The increasing prevalence of obesity calls for greater clinician awareness of its effects on fertility, better understanding of underlying mechanisms, and eventually avenues for mitigation or treatment. © 2008 American Society for Reproductive Medicine.

**Database:** EMBASE

#### **46. Men's body mass index and infertility.**

**Author(s):** Nguyen, Ruby H N; Wilcox, Allen J; Skjaerven, Rolv; Baird, Donna D

**Source:** Human reproduction (Oxford, England); Sep 2007; vol. 22 (no. 9); p. 2488-2493

**Publication Date:** Sep 2007

**Publication Type(s):** Research Support, N.i.h., Intramural Journal Article

**PubMedID:** 17636282

Available at [Human reproduction \(Oxford, England\)](#) - from Oxford Journals - Medicine

Available at [Human reproduction \(Oxford, England\)](#) - from HighWire - Free Full Text

Available at [Human reproduction \(Oxford, England\)](#) - from Unpaywall

**Abstract:**BACKGROUND In men, excess weight may be linked with altered testosterone, estradiol levels, poor semen quality and infertility. We investigated whether higher BMI among men is associated with infertility and if so, to what extent that effect might be mediated by altered sexual function. METHODS A retrospective cohort study of pregnancies from 1999 through 2005 based within the Norwegian Mother and Child Cohort Study (MoBa). Questionnaires assessed mother's and father's height and weight and time to pregnancy. Our sample comprises 26 303 planned pregnancies. Couples were considered infertile if they took  $\geq 12$  months to achieve pregnancy or received infertility treatment. RESULTS After adjusting for the woman's BMI, coital frequency and the ages and smoking habits of both partners, the odds ratio for infertility was 1.20 for overweight men [BMI 25-29.9; 95% confidence interval (CI) = 1.04-1.38] and 1.36 for obese men (BMI 30-34.9; 95% CI = 1.13-1.63) relative to men with low-normal BMI (20.0-22.4). When BMI was divided into eight categories, there was a trend of increased infertility with increased male BMI. The effect of men's BMI was nearly identical when coital frequency was not included indicating that the effect is not

mediated by sexual dysfunction in heavier men. **CONCLUSION** This study adds further support that men with excess body weight are at increased risk of infertility. Values may be underestimated because the most severe cases, couples who do not conceive, are not included in this birth cohort. Research is needed to see if weight loss improves fertility for these men.

**Database:** Medline

## Strategy 792151

#	Database	Search term	Results
1	Medline	(BMI OR "body mass index").ti	19619
2	Medline	exp "BODY MASS INDEX"/	121845
3	Medline	(1 OR 2)	125786
4	Medline	(male ADJ2 (fertility OR infertility)).ti	5577
5	Medline	exp "INFERTILITY, MALE"/	27239
6	Medline	(4 OR 5)	28857
7	Medline	(3 AND 6)	144
8	Medline	(obesity OR obese).ti	116955
9	Medline	exp OBESITY/	204525
10	Medline	(8 OR 9)	223931
11	Medline	(6 AND 10)	220
12	Medline	(paternal OR father*).ti	11286
13	Medline	exp FATHERS/	8707
14	Medline	(12 OR 13)	15973
15	Medline	(miscarriage OR "spontaneous abortion").ti,ab	16372
16	Medline	exp "ABORTION, SPONTANEOUS"/	36322
17	Medline	(15 OR 16)	44693
18	Medline	(10 AND 14 AND 17)	1
19	Medline	(3 AND 14 AND 17)	2

20	Medline	(paternal ADJ2 (BMI OR "body mass index" OR obes*)).ti,ab	299
21	Medline	(17 AND 20)	2
22	Medline	(father* ADJ2 (BMI OR "body mass index" OR obes*)).ti,ab	248
23	Medline	(17 AND 22)	0
24	EMBASE	(BMI OR "body mass index").ti	29880
27	EMBASE	*"BODY MASS"/	30594
28	EMBASE	(24 OR 27)	36868
29	EMBASE	(male ADJ2 (fertility OR infertility)).ti	6591
30	EMBASE	exp "MALE INFERTILITY"/	40350
31	EMBASE	exp "MALE FERTILITY"/	8760
32	EMBASE	(29 OR 30 OR 31)	47199
33	EMBASE	*OBESITY/	175474
34	EMBASE	(32 AND 33)	214
35	EMBASE	(28 AND 32)	84
36	EMBASE	(miscarriage OR "spontaneous abortion").ti,ab	25851
37	EMBASE	exp "ABORTION, SPONTANEOUS"/	38141
38	EMBASE	(36 OR 37)	44672
39	EMBASE	(paternal OR father*).ti	12124
40	EMBASE	exp FATHER/	26972
41	EMBASE	(39 OR 40)	32887



42	EMBASE	(33 AND 38 AND 41)	2
43	EMBASE	(28 AND 38 AND 41)	3
44	EMBASE	((paternal OR father) ADJ2 (overweight OR obes* OR BMI OR "body mass index")).ti,ab	464
45	EMBASE	(38 AND 44)	5
46	Medline	exp OVERWEIGHT/	213357
47	Medline	(14 AND 17 AND 46)	0
48	Medline	exp "BODY WEIGHT"/	453078
49	Medline	(14 AND 17 AND 48)	6
50	Medline	(father* OR paternal).ti,ab	56472
51	Medline	(17 AND 46 AND 50)	2
52	Medline	(parental ADJ2 (obes* OR BMI OR overweight OR "body mass index")).ti,ab	1107
53	Medline	(17 AND 52)	1
54	EMBASE	(parental ADJ2 (obes* OR BMI OR overweight OR "body mass index")).ti,ab	1137
55	EMBASE	(38 AND 54)	3
56	Medline	(6 AND 48)	435
57	Medline	56 [Document type Review]	79