

The effect of environmental factors on seminal fluid analysis parameters in fertile male

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تحليل السائل المنوي لدى الذكر الخصب وتأثير العوامل البيئية على معايير السائل المنوي

الخلاصة

تعتبر مشكلة العقم من المشاكل المهمة في هذه الأيام وان ٥٠% من الحالات يكون الذكر هو السبب. لتحديد قابلية الذكر على الإخصاب يتم فحص السائل المنوي للذكر. أجريت الدراسة على ١٦٦ رجل ممن زاروا مركز العقم في مستشفى الصدر التعليمي من آذار إلى تشرين الأول ٢٠٠٩ وكان الهدف من الدراسة لمعرفة أي من المعايير في تحليل السائل المنوي ذو أهمية لتحديد قابلية الإخصاب لدى الذكور ولمعرفة أي من الذكور يمكن تصنيفه عقيم أو قابلية الإخصاب لديه قليلة اعتمادا على هذه المعايير. تم إجراء تحليل السائل المنوي لكل المشتركين في الدراسة وقارنتها بمعايير منظمة الصحة العالمية وأظهرت النتائج بان عدد الحيامن وحركتها وشكلها وحجم السائل المنوي اقل في المدخنين وان عدد الحيامن وحركتها اقل في العاملين في الأماكن الحارة. نستنتج من هذه الدراسة بان عدد الحيامن وشكلها أكثر أهمية في تحديد قابلية الحمل وأظهرت الدراسة بان التدخين والسمنة والعمل في الجو الحار يؤدي إلى تقليل قابلية الإخصاب.

Abstract

Infertility is a common abnormalities nowadays, in about 50% of cases the causes due to certain pathology in male. One of the common criteria for determination of fertility status in males is seminal fluid analysis. This study was conducted on 166 male attending infertility center in Al-Sadr teaching hospital, Najaf city during period from March to October 2009. Our aim was to determine which seminal fluid analysis parameters are important to determine fertility potential and which male should be regarded as subfertile. Seminal analysis was performed for every participant and compared with WHO criteria. The result of the study showed that sperm count, motility and quality and seminal fluid volume is less in smokers than non smokers (P value for concentration and morphology <0.0001) In addition to this the sperm count and motility was less in those who work in hot weather. In conclusion the study showed that sperm count and morphology is more important than sperm motility and seminal fluid volume in determination of pregnancy. The study also showed that smoking, obesity, and hot weather lead to decrease fertility.

Introduction

Infertility is inability of the female to get pregnancy after 1year of un protected regular sexual intercourse. About 1/3 of the cases it is because of the man and in 1/3 it is because of the woman and the rest because of both partners or no cause is found .There is prevailing concern among clinicians that the recent WHO values for seminal fluid are too strict.

There are no clear guidelines for discriminating fertile men from infertile men based on the reference values of WHO. This is partly attributed to the fact that these criteria do not strictly fit with the true fertility potential of subjects. Because there is no standard reference normal values , there is risk of misclassify patients with normal

sperm parameters as having abnormal sperm function(1) This error could cause unnecessary anxiety on the part of the unaffected subjects, it might also lead to unwanted investigations and interventions for the patients . Typically 2-3 semen analysis should be done over a 3 months period to make any final conclusion regarding the baseline sperm quality or quantity . However , if the first semen analysis is normal , the repeat test is not required. Seminal fluid analysis can be done by computer nowadays, Computer Assisted Semen Analysis (CASA) which is done mostly for assessment of sperm concentration and specific pattern of sperm motility. WHO criteria of semen analysis(2)

Volume $\square \geq 2\text{ml}$

PH \square 7.2-7.8

Sperm concentration $\square \geq 20$ million /ml

Sperm motility $\square \geq 50\%$ actively motile

Sperm morphology $\square \geq 30\%$ normal morphology

Liquefaction time \square 20-30 minutes

WBC count $\square < 1$ million/ml

Male fertility could be affected by body weight by environmental factors especially smoking and work . Men with increased body mass index (BMI) were significantly more likely to be infertile than normal- weight men(3) ."The data suggest that a 20-pound increase in men's weight may increase the chance of infertility by about 10 percent . BMI is a number calculated from a persons weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems.

so it is possible that overweight men have less sexual intercourse than their normal weight counterparts and this could influence fertility however there have been recent studies looking at semen characteristics that show lower semen quality for overweight and obese men, as well as hormonal differences(3).

As well as placing undue pressure on the body's respiratory, circulatory, immune and eliminative systems, smoking interferes with the absorption of vitamins and minerals essential in maintaining reproductive health.

In males, smoking is known to reduce fertility by: Lowering the sperm count, harming the mobility of the sperm, affecting the shape of the sperm, reducing the amount of semen, and causing impotence.

Materials and Methods

This study was conducted on 166 males who visit the fertility center of Alsadr hospital at the period from March – October 2009 in Al-Najaf city. Detailed history and examination including age, weight, occupation, residence and social history was taken from each patient.

The patients were divided into two groups, group I 75 male had infertility and group II 91 of them were fertile and had their 2nd wives got pregnant within the last 6 months or got pregnant during the duration of the study which last for 8months of our studied group careful history was taken which show that they had normal sexual history and history of smoking and type of work was taken, then they had been examined for body weight and height and by urologist who revealed that they have been normal and had no impotence , normal ejaculation , no retrograde ejaculation. Then they had been sent for investigations for example FSH , LH , GnRH , testosterone and prolactin. In 75

of them the investigations were abnormal and they have infertility, while in 91 of them the investigations were normal.

Then the males with normal history, examination and investigations sent for seminal fluid analysis which has been done after 3days of sexual abstinence . The seminal fluid collected in the test tube by masturbation in the laboratory and the manual examination of the seminal fluid done by a trained and licensed medical technologists.

The seminal fluid parameters of the fertile males were compared to the WHO reference values. The BMI were measured for each male by dividing weight in Kilograms by the height in meter square.

Results:

For a period of 8 months 91 male with normal history and hormonal assay were included in our study and seminal fluid was collected from each patients and the results compared to WHO criteria as shown in table 1

The result of the study showed that 100% of the samples reaching WHO criteria regarding percentage of normal morphology sperm and we also see that 96.7% of samples reaching WHO criteria regarding sperm concentration. Regarding sperm motility only 90% of semen reach WHO criteria so sperm motility has limited value in pregnancy predication.

Table (1): the number and percentage of different seminal fluid parameters that met WHO reference criteria of 91 male with normal hormonal assay.

Seminal fluid parameter	Number reach WHO criteria and %
PH	91/91 (100%)
Volume	83/91 (91.2%)
Liquefaction time	82/91 (91.1%)
Sperm concentration	88/91 (96.7%)
Active motility	82/91 (90.1%)
Sluggish motility	75/91 (83.2%)
Normal morphology	91/91 (100%)
WBC	73/91 (80.2%)

The In our study 8 ejaculates were hypospermia (i.e. volume <2ml), but we can't exclude that in individual cases the ejaculates have not been collected completely. So from the above we conclude that the volume of seminal fluid is not an important parameter.

We divide the group II into 2 groups smokers(group IIa) and non smokers(group IIb) and then the seminal fluid analysis done for both groups . the study showed that

there is a decrease in sperm concentration and motility and volume and percentage of morphologically normal sperms in seminal fluid of smokers than in non smokers as shown in table2.

Table 2:comparison of seminal fluid parameters in both smokers and non smokers of the fertile males.

Seminal analysis	Mean in group IIa (n =64)	Mean in group IIb(n =27)	P value
Sperm count (concentration)	58	71	<.0001
Sperm motility	45	63	<.02
Normal morphology	70	84	<.001
Abnormal morphology	30	16	<.0001
Volume (ml)	2.1	3.4	<.01

On comparing the percentage of smokers in both fertile and infertile males we see that percentage of smokers in the infertile group was higher.

Table (3): show percentage of smokers and non-smokers in both fertile and infertile groups

Studied group	Fertile male (n =91)	Infertile male (n =75)
Smokers	33%	73%
Non smokers	67%	27%

To detect the effect of obesity on male fertility we measured the mean BMI in fertile and infertile males. Most infertile males had BMI>30 (68%) while82.1% of fertile male their BMI <30 as shown in table 4

Table (4): percentage of obesity in both fertile and infertile males.

Parameter	Fertile male (n =91)	Infertile male (n =75)
BMI ≥30	17.9 %	68 %
BMI <30	82.1 %	32 %

Regarding work we divide the studied group into 2 groups, group I (who work in hot weather for example bakers and factory workers) and group II who work in ordinary weather and we compare between seminal fluid of both groups . We found that sperm

concentration and motility decrease in group I while all other parameters of seminal fluid show no significant difference between the 2groups.

Table (5): show the mean sperm concentration and motility in both group I (work in hot weather) and group II (work in ordinary weather).

Type of work	Mean sperm concentration	Mean sperm motility
Group I= 23	52	57
Group II = 68	64	68

Discussion

It is well known that in about 50% of infertile couples the male is involved in the etiology. So seminal fluid analysis is very important, but sometimes the couples could be infertile although normal both partners and in contrast , the female could get pregnant even when the seminal fluid parameters is subnormal . In such a couple over treatment carry risks and cause financial burden and psychological stress.. Unfortunately there is large inter-laboratory variability regarding the analysis of semen specimens, in particular the assessment of sperm morphology making the comparison amongst laboratories difficult so we depend on WHO criteria of semen analysis.

There is few existing similar studies for example Ombelet et al .(4) evaluated the semen parameters of 144 men whose partner become pregnant within 12 months and were pregnant at the time of the study. In contrast to Ombelets group Menkveld et al.(5) not only used strict criteria to depict the morphology but also analysed the same sperm according to the WHO criteria.

- in recent publication Haugen et al. (6) pregnancy within 12 cycles their partner were pregnant at the time of study inclusion and compared the males partners who conceived in the 1st cycle after stop using contraception to those that conceived later they find that sperm number and motility is very important.
- Another large study published in 1998 by Chia et al .(7) determined the semen parameters according to the WHO criteria . The length of time until conception was not defined .
- The result of this study show that volume of seminal fluid is not an important parameter this goes with the results of Ombelet et al (4) and Menkveld et al .(5) who found that there is no difference in the mean volume of seminal fluid in fertile and infertile males and these goes also with the results of Bonde et al.(8) who found that the volume of seminal fluid is of limited value in pregnancy predication.
- in our study interestingly only 3 of the cases were oligospermia (i.e. concentration <20 million/ml) so the sperm concentration is an important parameter in detection of fertility. This results is coordinate with the results of Ombelet et al.(4) and Menkveld et al.(5) and Bonde et al .(8) and Haugen *et al* .(6). 90.1% of semens reach WHO criteria regarding sperm motility ,so it has limited significant this result goes with the results of Bonde et al.(8), but this result is incoordinate with the results of Ombelet et al.(4) and Menkveld et al .(5) and Haugen et al.(6) this difference in the results may be due to the difference in the technique used for seminal analysis since our study depend

on the manual method while the previous studies depend on CASA(computer assisted sperm analysis).

- The study also showed that the sperm morphology plays an important role in pregnancy predication. This results is coordinate with the results of Bonde et al.(8) and Ombelet et al.(4) and Menkveld et al .(5) , but the result is incoordinate with the result of Chia et al.(7) who found that >75% of fertile men had <30% normal morphology spermatozoa.So from the above results we conclude that the combination of several semen criteria appear to be more predictive than a single parameter.

Male smokers tend to have a sperm count that is 15 per cent lower than that of nonsmokers. It is generally considered that a man has a low sperm count if he has less than 20 million sperm in a milliliter of semen. There have been a number of reports that male sperm counts have declined over the past few decades and tobacco is known to be one of the key factors. Other reasons thought to contribute to a low sperm count include nutritional imbalances such as deficiencies in vitamin E, zinc and vitamin B₁₂, and hormonal imbalances. Smoking is also known to interfere with the absorption of vitamins and minerals and disrupt hormone balance. Any disorder that impairs blood flow in the penis has the potential to cause impotence. It is known that smoking can lead to the degeneration of the blood vessels that carry blood to the penis. An erection cannot occur unless blood can flow freely into the penis. Therefore it is important that these blood vessels are in a healthy condition to facilitate circulation

This study provides data on some additional health problems associated with obesity" said David A. Schwartz M.D director of the national institute of environmental health sciences. "Preventing obesity can help improve men's overall health, perhaps even their reproductive health". (3)

The conclusion from our study is that sperm concentration and morphology has major role in pregnancy prediction than sperm motility or volume.

So as a general our results appear similar to the results of Bonde et al.(8) than the results of Ombelete et al.(4) and Menkveld et al.(5) and Haugen et al.(6) . this occur probably because we use WHO criteria to detect sperm normal morphology while Ombelete et al.(4) and Menkveld et al.(5) use tygerberg's criteria (3) to detect normal sperm morphology.

We conclude that as proposed by the WHO, it is preferable for each laboratory to determine it is own normal range for each variable.

Our data revealed that further investigations and standardization is needed.And also we conclude that obesity and smoking decrease chances of fertility in males.

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