RESEARCH ARTICLE

Effect of Sperm Morphology on Success Rate of Pregnancy by Intra Uterine Insemination

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ABSTRACT

Background: Fertility can be affected by multiple factors and have a major impact on couples' lives. One of these factors is abnormal seminal fluid parameters. This study concentrates on sperm morphology's impact on pregnancy rate by intrauterine insemination.

Aim of Study: To evaluate the effect of sperm morphology on the success rate of pregnancy by intrauterine insemination.

Materials and Methods: From 1 July 2017 to 1 November 2018, 100 couples with primary or secondary infertility, 50 with normal sperm morphology, and 50 with abnormal sperm morphology were included. History occupied from the patient, clinical examination was done. The couples had either primary or secondary infertility, so they had already did baseline investigation for Intrauterine insemination (IUI) as part of their investigation for infertility: at least 2 seminal fluid analysis saturated fatty acid (SFA), thyroid function test, serum prolactin, day 3 of cycle serum LH and FSH, E2 hormones and ovulation follow up by serial ultrasound tracing and mid-luteal serum progesterone. Either HSG or diagnostic laparoscopy assured tubal patency. The patient had day 2 Transvaginal ultrasound as a baseline for AFC and exclusion of any pathology in both ovaries. Most males are sent for urological examination and sent for the US for exclusion of varicocele or any pathology.

Result: In this study, out of 100 patients, 13% got pregnant, and 87% did not get pregnant normal sperm morphology ranges from 1-100 mean value 22.82 and standard deviation ± 27.901. Half the partners had abnormal sperm morphology, and the other half had normal sperm morphology. There is no relationship between unexplained malefactors and sperm morphology as the *p-value* was 0.799, statistically significant. No relation between varicocele and sperm morphology *p-value* is 0.118. No relation between oligospermia and sperm morphology *p-value* was 0.140. There was an association between asthenospermia and abnormal sperm morphology as the *p-value* was 0.037 witch is statistically significant.

Conclusion: This study concluded that the success rate of intrauterine pregnancy assisted by IUI was not influenced by sperm morphology.

Keywords: Intrauterine insemination, Malefactors infertility, Sperm morphology.

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INTRODUCTION

Infertility is the failure of a couple to become pregnant after one year of regular, unprotected intercourse. In both men and women, the fertility process is complex. Infertility affects about 10–15% of all couples. Even under ideal circumstances, the probability that a woman will get pregnant during a single menstrual cycle is only about 30–50%.[1] Infertility is either primary, in which no previous pregnancy has occurred, or secondary, in which prior pregnancy has occurred irrespective of its outcome.[2,3] Thorough history-taking, and physical examination must, however, be performed in every man with abnormal semen parameters. According to the findings, additional tests can be indicated in selected patients.[4] Ascending infections caused by sexually transmitted pathogens, such as *Chlamydia trachomatis* or typical uropathogens, such as *Escherichia coli*, play a key role in the etiopathogenesis of the condition; other factors include the hematogenous spread of systemic, typically viral infections.[5] Cryptorchidism (undescended testicles) bilateral cryptorchidism causes a significant decrease in spermatogenesis in comparison with unilateral cryptorchidism.[6] However, unilateral cryptorchidism usually has much less impact. Since sperm are produced after puberty, they risk an autoimmune response from the developed immune system. They remain protected by the testicular blood-testis barrier and secretion of immunosuppressive agents by macrophages and/or sertoli cells.[7] Semen analysis is a simple and relatively inexpensive test used to evaluate male infertility. Although tests with abnormal findings clearly lead to failed

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fertilization and conception, male infertility can still be found in some men with completely normal sperm parameters. The semen analysis is a standardized test and requires that the patient abstains from ejaculation between 2 and 4 days before collection. The sperm sample should be produced in the facility processing and performing the analysis, but the patient can also transport it to that facility under proper conditions and within 60 to 90 minutes after home collection.[8] Sperm morphology can be assessed in several ways. The most common classification systems are the 4th and 5th edition World Health Organization (WHO) standards that incorporate Kruger's strict criteria for assessing normal forms.[9] This technique uses a thin, flexible catheter to place a prepared semen sample into the uterine cavity. First, motile, morphologically normal spermatozoa are separated from dead sperm, leukocytes, and seminal plasma. This highly motile fraction is then inserted trans cervical near the anticipated time of ovulation. Intrauterine insemination can be performed with or without superovulation and is appropriate therapy or treatment of cervical factors, mild and moderate male actors, and unexplained infertility. IUI timed by urine luteinizing hormone (LH) surge is an initial strategy that achieves reasonable pregnancy rates of up to 11 percent per cycle.[10]

Aim of the Study

To evaluate the effect of sperm morphology on the success rate of pregnancy by intrauterine insemination.

METHOD

A cross-sectional study was done at the high institution for infertility identification and aided reproductive technique at Al-Nahreen Medical College and Um-Albaneen fertility center at Al-Alimamein Kadhimein medical city from 1 July 2017 to 1 November 2018 in Baghdad, Iraq. The Scientific Council of Obstetrics and Gynecology, Arabic Board approved the study design for Medical Specializations. Our study included 100 couples: 50 couples with abnormal sperm morphology and 50 couples with normal sperm morphology. Both have a period of infertility.

Inclusion Criteria

- Females aged between 22 to 40 years old have either primary or secondary infertility.
- Mean total motile sperm count greater than or equal to 10 million.
- Patient oral consent.

Exclusion Criteria

- Patient age less than 22 or more than 40 years old.
- Mean total motile sperm count less than 10 million.
- Sever male seminal fluid abnormality.
- Sever decrease in ovarian reserve.
- Bilateral tubal occlusion.
- Known case of severe endometriosis (already diagnosed by laparoscopy).

History was taken from the patients; the clinical examination was done. The couples had either primary or secondary infertility, so they had already done baseline investigation for IUI as part of their investigation for infertility: at least two seminal fluid analyses at least one month apart, thyroid function test, serum prolactin, day 3 of cycle serum LH and FSH, E2 hormones and ovulation follow up by serial ultrasound tracing and mid-luteal serum. History was taken from the patients, the clinical examination done. The couples had either primary or secondary infertility so they had already done baseline investigation for IUI as part of their investigation for infertility: at least two seminal fluid analyses at least one month apart, thyroid function test, serum prolactin, day 3 of cycle serum LH and FSH, E2 hormones and ovulation follow up by serial ultrasound tracing and mid-luteal serum progesterone. Either Hysterosalpingography (HSG) or diagnostic laparoscopy assured tubal patency. Patients had day 2 Transvaginal ultrasound as the baseline for antral follice counts (AFC) and excluded any pathology in both ovaries. The patients underwent ovarian stimulation by either clomiphene citrate or recombinant FSH. 0.3 mL of washed and concentrated sperm inserted through an elastic polyethylene catheter inside the uterine at the time of ovulation. The patient should stay lay down for 10-15 after injection. Wash in culture and eliminate the "proteins and prostaglandins" from semen, leading to uterine pains or anaphylactic responses. Thickness incline centrifugation improves most extremely motile as well as morphologically usual sperm. Best consequences have gotten when the motile sperm > 10 million. Usual sperm live and can fertilize for 3 days, but an oocyte lives for 12 to 24 hours. The procedure may be repeated 2 to 3 times for 2 to 3 days. To increase sperm motility uses pentoxifylline. Usually, three cycles of insemination are advised, but only one cycle is done in this study (because of poor patient compliance). When the patient had a missed period, we did a pregnancy test, and when it was positive after 2 weeks, we did an ultrasound to confirm intrauterine pregnancy. Data analysis was done using statistical packages for social science SPSS (version 24). Data were presented in simple measures of frequency, percentage, mean, standard deviation, and range (minimum-maximum values). The level of significance was valuable whenever the $p \leq 0.05$.

RESULTS

A total number of 100 patients was taken, 50 with normal sperm morphology and 50 abnormal sperm morphology of the partner. Their age, weight, height, body mass index was calculated. Baseline investigations for IUI were done. Controlled ovarian stimulation was done pregnancy results were traced, recorded, and confirmed by ultrasound results.

Table 1 demonstrates that the age of the participant females ranges between 22 and 40 years old with the mean age being 30.93 and a stander deviation of 5.046. The mean of patients' BMI was 25.53 with a stander deviation of 6.049, ranging from 18 to 40. Of our total patients, 71% had no prior pregnancies, while 29% of them had prior pregnancies. A 7% suffered from tubal problems, 93% had no tubes problems, 10% had uterine factors problems 90% had none, 7% had recurrent pregnancy

Table 1: Demographic characteristics and female factors

Variable		*No.*	*%*
Age (years) Mean ± SD (Range)		30.93 ± 5.046 (22–40)	
BMI Mean ± SD (Range)		25.53 ± 6.049 (18–40)	
Number of prior pregnancies	0	71	71
	1	13	13
	2	9	9
	3	6	6
	4	1	1
Tubal factor (unilateral blockage or surgically removed)	Yes	7	7
	No	93	93
Uterine factors	Yes	10	10
	No	90	90
Recurrent pregnancy loss	Yes	7	7
	No	93	93
Ovulatory dysfunction	Yes	21	21
	No	79	79
Hyperprolactinemia	Yes	19	19
	No	81	81
Obesity	Yes	35	35
	No	65	65
Unexplained female factor	Yes	8	8
	No	92	92
Ovulation induction	Yes	100	100
	No	0	0
HCG Administration	Yes	100	100
	No	0	0
Intrauterine pregnancy	Yes	13	13
	No	87	87

Table 2: Male factors

Total sperm count (million) Mean ± SD (Range)		*91.09 ± 49.97 (10–250)*	
Sperm morphology (%) Mean ± SD (Range)		22.82 ± 27.901 (1–100)	
Sperm morphology	Normal	50	50
	Abnormal	50	50
Azoospermia	Yes	0	0
	No	100	100
Oligospermia	Yes	8	8
	No	92	92
Asthenospermia	Yes	13	13
	No	87	87
Ejaculatory dysfunction	Yes	8	8
	No	92	92
Varicocele	Yes	18	18
	No	82	82
Hypogonadism	Yes	6	6
	No	94	94
Unexplained male factor	Yes	19	19
	No	81	81

Table 3: Intrauterine pregnancy in relation with sperm morphology

		Intrauterine pregnancy positive	*negative*	*Total*	*p-value*
Sperm morphology	Normal	7	43	50	0.5
	Abnormal	6	44	50	
Total		13	87	100	

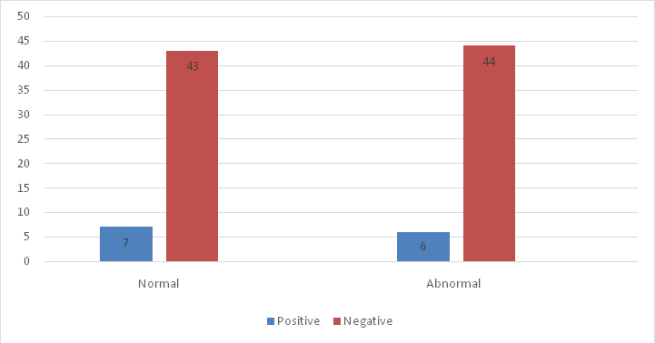

Figure 1: 50 couples with males had normal sperm morphology 7 of them got positive intrauterine pregnancies, and 50 couples with males had abnormal sperm morphology 6 of them had positive intrauterine pregnancies.

loss, 93% did not 21% of our patients suffered from ovulatory dysfunction, 79% had a normal ovulatory function, 19% had hyperprolactinemia 81% had normal prolactin concentration, 65% of total patients were obese 35% of them had normal BMI, 8% of total patient had unexplained female factor infertility 92% had none, all of our patient underwent ovulation induction by either CC or recombinant FSH (gonal f), all of them took recombinant HCG injection after confirmation of dominant follicle size of more than 17 mm, 13% of all our patient got pregnant while 87% of them did not.

Table 2 shows malefactors with total motile sperm counts ranges from 10–250 with a mean value of 91.09 and standard deviation ± 49.97. Normal sperm morphology ranges from 1 to 100 mean value 22.82 and standard deviation ± 27.901. Half the partners had abnormal sperm morphology and the other half had normal sperm morphology, No one had azoospermia. Of them, 8% had oligospermia, 13% had asthenospermia, 8% had ejaculatory dysfunction, 18% had varicocele, 6% suffered from hypogonadism, 19% had unexplained male factors infertility.

Table 3 shows that 50 couples with male normal sperm morphology 7 got intrauterine pregnancy (14% pregnancy rate). Abnormal sperm morphology couples 6 got intrauterine pregnancy (12% pregnancy rate) (Figure 1). A total pregnancy of 13 intrauterine pregnancies in this study for both groups (13% pregnancy rate). A p-value was 0.5, so there is no association between sperm morphology and the success rate of intrauterine pregnancy.

Table 4 shows there is no relationship between unexplained male factors male etiologies of infertility were excluded) and sperm morphology as $p = 0.799$, which is statistically none significant. No relation between varicocele and sperm morphology ($p = 0.118$). No relation between oligospermia

Table 4: Malefactors in relation with sperm morphology

Variable		*Morphology ≤4% (Abnormal)*	*Morphology >4% (Normal)*	*p-value*
Unexplained male factor	Yes	10	9	0.799
	No	40	41	
Varicocele	Yes	6	12	0.118
	No	44	38	
Oligospermia	Yes	2	6	0.140
	No	48	44	
Asthenospermia	Yes	10	3	0.037
	No	40	47	
Hypogonadism	Yes	2	4	0.399
	No	48	46	
Ejaculatory dysfunction	Yes	6	2	0.140
	No	44	48	
Azoospermia	Yes	0	0	N/C
	No	50	50	

and sperm morphology p = 0.140. A significant association between asthenospermia and sperm morphology p-value 0.037. No relation between hypogonadism and sperm morphology p-value was 0.399. No relation between ejaculatory dysfunction and sperm morphology p-value was 0.140.

DISCUSSION

This study aimed to find the effect of sperm morphology on intrauterine insemination-related pregnancy. In our study, the total of 13% clinical pregnancies were achieved with women of a partner who had normal sperm morphology (14% pregnancy rate) and abnormal sperm morphology (12% pregnancy rate), but the findings demonstrated that there is no significant differences between the success rate of intrauterine pregnancy and status of sperm morphology. These findings were in agreement with Motazedian S *et al*. that reported success rate in 59 cases (10.5%); 30 with women of a partner who had >20% abnormal sperm morphology, and 29 cases with women of a partner who had ≤20% abnormal sperm morphology. There was no significant association between the success rate status of IU pregnancy and the percentage of abnormality of sperm morphology.[11] But in disagreement with the results of Rezaie Z *et al*., who has been reported a pregnancy rate of 19.5% per couple and 6.8% per cycle (39 cases), as well as they, reported a significant association between the success rate of IU pregnancy and sperm morphology, where they compared cases with a partner of 60% of normal and abnormal morphology and found that the gestation rate does not have any relative to sperm amount and motility, but it connected to sperm morphology. When sperm look was > 60% normal, gestation rate was 24% compared to 7% when it was < 60% normal, the gestation rate in pair have secondary infertility was significantly more than in pairs with primary infertility.[12] The total clinical pregnancy rate observed in this study was higher than Stephanie M. Luco's that reported a success rate of an intrauterine pregnancy in 5.3% of their group but lower than findings of Badawy's study that found the pregnancy rate per cycle was 11.06% and per couple was 20.1%.[13,14] Data were obtained from 30 trials involving 16,915 IUI cycles. No significant difference was seen between the average pregnancy success for couples with a sperm morphology ≥ 1%: 14.0% compared to the pregnancy success for couples with sperm morphology <1%: 11.0%; between-group difference (p = 0.373). Group difference was noted, controlled for a potential confounder of least entire motile sperm count for strict morphology <1%. This designates that the entire motile count significantly affects the IUI gestation achievement rate when severe morphology is <1%. For all other groups, the least IUI entire motile count and average study year were insignificant.[15] Also, the mean age of included women was 30.93 ± 5.04, but the success rate was low (13%), and this finding demonstrated that age has no role in increasing the rate of success of IUI. This finding is in agreement with Schorsch M *et al*. that evaluated the success rate of IUI in women with a mean age of 33.9 years and found that the rate for women aged 40 and 41 did not vary from those of women aged between 35 and 39 years and the whole pregnancy rates were constant in women up to the age of 40.[16] Other studies conducted by Iberico G *et al*. and Wang B *et al*. were found that the rate of pregnancy after IUI was decreased with increasing the age of women.[17,18] The mean value of BMI in our studied group was 25.53 ± 6.049, and this mean value of women was within the normal range, but the success rate was low as well as that 20 of > 4% morphology was obese and 15 of < 4% morphology was obese, and this finding are in disagreement with Huyghe S *et al*. that investigate data from 1401 IUI cycles and found there was a significant influence of female BMI on pregnancy rate as the success rate was increased with increasing the BMI of the women (6, 5%, 8%, 16, 3% and 9, 4% for a female BMI < 20, 20–24.9, 25–29.9 and 3-30, p = 0.03).[19] In the current study the mean number of sperm count for a group of ≤ 4% morphology was 88.1 and for ≥4% morphology was 94.08,

and this results revealed that the sperm count was normal with both groups and had no role in determining the success rate of intrauterine pregnancy after IUI. A study of Zhang E was found that the pregnancy rate with IUI was higher with the subject of sperm count $\geq 5\times10^6$ in comparison to those of sperm count $<5\times10^6$, and the pregnancy rate was compared among the groups with initial total progressive sperm count $5–9.9\times10^6$, $10–19.9\times10^6$ and $\geq 20\times10^6$ (12.73, 11.11, and 13.68%, respectively but they do not point out to the morphology of the sperm in their study.[20] Our results indicated there was no significant association between the status of sperm morphology (≤ 4 or $\geq 4\%$) and each of varicocele, oligospermia, hypogonadism, ejaculatory dysfunction status, but the significant association was seen with asthenospermia ($p=0.03$). as well as there was a nearly similar frequency of subjects with unexplained malefactors were distributed according to morphology status. Weiner R *et al*. reported that sperm morphology was not in itself a significant factor that affected the likelihood of IUI success, where they showed a total clinical pregnancy rate/ cycle of 12.9% among 2564 IUI cycles in couples with malefactors infertility.[21] Dickey *et al*. and Van Voorhis *et al*. got the best gestation rates when > 10 million motile spermatozoa were designated. It has been recommended that the number of motile spermatozoa fertilized is a potential prognostic issue.[22,23]

CONCLUSION

This study concluded that the success rate of intrauterine pregnancy assisted by IUI was not influenced by sperm morphology.

REFERENCES

1. Haleem AM, Badri RM, Mohammed SJ. Statistical study of some women infertility causes within Baghdad city. Int. J. Adv. Res. 2014;2(4):990-994.
2. Abdalla NM. Epidemiology of infertility in Gezira region, central of Sudan. Res. J. Med. Sci. 2011 Jan 1;5(1):56-60.
3. WHO. Defining sexual health Sexual health document series. WHO publications, 2013;1-35.
4. Tournaye H. Diagnosis and management of male infertility. In: Emre Seli (edi.). Infertility. UK: Wiley Blackwell publishing; 2011;71.
5. Weidner W, Pilatz A, Diemer T, *et al*. Male urogenital infections: impact of infection and inflammation on ejaculate parameters. World J Urol. 2013;31:717-723.
6. Kobayashi H, Nagao K, Nakajima K.Advanced Studies in Medical Sciences. 1. Vol. 1. HIKARI Ltd;. Therapeutic Advances in the Field of Male Infertility: Stem Cell Research; 2013;39-54.
7. Jacobo P, Guazzone VA, Theas MS, *et al*. Testicular autoimmunity. Autoimmun Rev. J.2011;10:201-204.
8. Jesse Hade. The infertility work up. In: Steven R.B., Michael M.A., Alan S.P. (Ed.). The Boston IVF hand book of infertility. 4th ed. 6000 Broken Sound Parkway NW, Suite 300, United States: CRC press Taylor & Francis group; 2018;31-32.
9. Kaylen M. Silverberg and Tom Turner. Evaluation of sperm. In: David K. Gardner , Ariel Weissman, Colin M. Howles *et al* (edts). Textbook of Assisted Reproductive Techniques. 4th edition. 6000 Broken Sound Parkway NW, Suite 300: Taylor & Francis Group; 2012;51-52.
10. Steures P, van der Steeg JW, Verhoeve HR, *et al*: Does ovarian hyperstimulation in intrauterine insemination or cervical factor sub fertility improve pregnancy rates? Hum Reprod 2004;19: 2263.
11. Motazedian S, Hamedi B, Zolghadri J *et al* The effect of sperm morphology on IUI outcome in cases with unexplained and male factor infertility. Iran. J. Reprod. Med. 2010;8(1):41-44.
12. Rezaie Z. Azmodeh O, Hamadani N H *et al*. Intrauterine insemination: pregnancy rate and its associated factors in a university hospital in Iran. Middle East Fertil. Soc. J. 2006;11(1): 59-63.
13. Stephanie M, Luco, Chioma Agbo, Barry Behr, *et al*. The evaluation of pre and post processing semen analysis parameters at the time of intrauterine insemination in couples diagnosed with male factor infertility and pregnancy rates based on stimulation agent. A retrospective cohort study. Eur. J. Obstet. Gynecol. 2014;179:159-162.
14. Badawy A, Elnashar A, Eltotongy M. Effect of sperm morphology and number on success of intrauterine insemination. Fertil Steril. J. 2009;91:777-781.
15. Kohn T.P., Shabtaie S.A, Ramasamy R. Effect of strict sperm morphology on intrauterine insemination pregnancy success: a systematic review and meta-analysis. 2016;116(3):E91-99.
16. Schorsch M, Gomez R, Hahn T *et al*. Success Rate of Inseminations Dependent on Maternal Age? An Analysis of 4246 Insemination. Geburtshilfe Frauenheilkd. J. 2013;73(8):808-811.
17. Iberico G, Vioque J, Ariza N, Lozano JM, Roca M, *et al*. analysis of factors influencing pregnancy rates in homologous intrauterine insemination. Fetil Steril. J. 2004 May;81(5):1308-1313.
18. Wang B, Hu Y, Sun H, Zhang N, Xu Z. Investigation of correlative factors affecting successful intrauterine insemination. Zhonghua Nan Ke Xue. 2004 Jul; 10(7):526-529.
19. Huyghe S, Verest A, Thijssen A, Ombelet W. Influence of BMI and smoking on IUI outcome with partner and donor sperm. Facts Views Vis Obgyn. 2017;9(2):93-100.
20. Zhang E, Tao X, Xing W, Cai L, Zhang B. Effect of sperm count on success of intrauterine insemination in couples diagnosed with male factor infertility. Mater Sociomed 2014 Oct;26(5): 321.
21. Wainer R, Albert M, Dorion A, Bailly M, Bergere M, *et al*. Influence of the number of motile spermatozoa inseminated and of their morphology on the success of intrauterine insemination. Hum Reprod. J. 2004 Sep; 19(9):2060-2065.
22. Miller DC, Smith GD, Randolph JF, *et al*. Processed total motile sperm count correlates with pregnancy outcome afterintra-uterine insemination. Urology. J.2002;60:497-501.
23. Dickey RP, Lu PY, Taylor SN, *et al*. comparison of the sperm quality necessary for successful intra-uterine insemination with World Health Organization threshold values for normal sperm. Fertil Steril. J.1999;71:684-689.