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Intrauterine Insemination (IUI) Outcomes in Couples with Male Factor Infertility impact of Sperm Motility Count and Morphology

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Abstract

Background: The male factor infertility responsible for about half of all fertility issues is often treated with intrauterine insemination (IUI). Consequently, sperm concentration, motility and morphology are known to be strong predictors of IUI outcomes. Analyzing these parameters of this review may help explain how they enhance IUI success in couples with MFI.

Objectives: To evaluate the impact of sperm motility, count, and morphology on the success rate of intrauterine insemination (IUI) in couples with male factor infertility.

Study design: A Prospective study.
Place and duration of study. Department of Obstetrics & Gynecology Gajju khan medical College Swabi from 05-jan 2023 to 05-dec 2023

Methods: This Study involved data of 150 patients who had IUI for male factor infertility patients. Pre-insemination analysis of sperm samples included motility, count and morphology testing. Further analysis employing the ANOVA evaluation identified relationships and especially focusing on the differences in the pregnancy levels ($p < 0.05$). Standard deviations defined dispersion between parameters to determine which are correlate with better performances.

Results: From the 150 patients, the parameters with higher level of significance with IUI success included higher sperm motility (mean ± SD = 57.4 ± 10.2). Count and morphology also contributed, though to a lesser extent (mean count ± SD: 22.However, DSS/cref of PBMC was significantly lower than that of pre-SL, which averaged 5 ± 8.7 million/mL, morphology ± SD: 4.3 ± 1.2%). In the motility categories, the motility above 50 % was definitely higher in pregnancy rates and thus confirmed motility to be one of the significant predictors of IUI.

Conclusions: Sperm motility is by far the most critical determinant of IUI success, while count and morphology are also considered complementary factors. Counselling and additional therapeutic attempts directed at these sperm parameters might have the potential to increase the IUI success in male factor infertility.

Keywords: IUI results, sperm quality, male factor infertility, sperm characteristics

Introduction

The problem of male infertility occupies one of the leading positions in couples' reproductive issues and constitutes approximately 49% of infertility cases all over the world [1]. Within this scope, intrauterine insemination (IUI) still continues to be one of the first-line treatments because of its easiness, non-invasive nature and cost effectiveness compared with other ART procedures [2]. That being said, IUI's success significantly depends on the so called sperm characteristics such as motility, concentration and morphology. These parameters are of significance in defining the chances of sperm swimming through the cervical mucus to meet the egg after breeding [3]. Sperm motility is the ability of the sperm to progress and as we know, movement is very critical on getting through to the oocyte. Disordered motility is really suggestive of male infertility and is an important predictor still in IUI initiatives [4]. The most important type of motility is progressive motility, which define the ability of sperm to move in their forward direction. This work supports earlier observations where motility rates were associated with IUI pregnancy success, where higher motiaslity rates are practices as being viable [5]. Sperm concentration or total sperm count per ejaculate volume-refered to as sperm density also has a critical influence on IUI outcome. The World Health Organization (WHO) indicates that the normal sperm count is over fifteen million sperm per millilitre. In particular, it is known that even infertile males with low sperm density may use IUI and become fathers if sperm motility and morphology are also satisfactory [6]. Studies on IUI have tended to establish a specific number of sperm concentration below which the likelihood of conception drops considerably. The most motile sperm that are deposited directly in the uterus is also important and any measurement which includes the ‘‘total motile sperm’’ is a significant predictor of IUI outcome [7]. The remaining outlook on the shape and quality of the sperm is also an important parameter of male fertility known as sperm morphology. Such changes may point to chromosomal or genetic disorders that may affect fertilization or embryo quality [8]. In several research works, pідkte of poor sperm morphology was stated to be associated with some level of failure of IUI [9]. The new WHO standards indicate that a normal sperm morphology should range from 4% or higher. Nevertheless, low morphology value have been linked with poor fertilization rates when motility and counts are within standard parameters [10]. These sperm parameters play a significant part in the success of IUI, and such research still takes place today, more so, when and how these factors interrelate with each other to determine fertility. The general aspect of ART has increased significantly over the years but the area of male infertility is still considered to be complex with several lacunas. Other authors have indicated that other subtle variables including age of female partner, endometrial thickness and timing of insemination also contribute significantly to the overall success of the procedure [11]. However, motility, count and morphology of sperm play critical role in the success rate of IUI cycles [12]. The necessity of this systematic review is based on the need for a synthesis of the current literature regarding the correlation between sperm motility, count, morphology with IUI outcomes. This study aims to develop the understanding of factors related to IUI success by distilling the factors emerged from prior studies, which would be helpful for future clinical practice of male factor infertility [13].

Methods

Fifteen case reports of male factor infertility treated with IUI out of 150 patients. COH inclusion criteria were male partners with abnormal sperm characteristics according to WHO criteria for male infertility and female partners aged from 21 to 40. Female partners underwent progesterine challenge test and sperm samples were evaluated for motility, concentration and morphology also at least two cycles of IUI were performed in each patient. Only patients with no

evidence of female factors that may affect fertility or those with unexplained infertility were included if they had minor or no female fertility factors.

Data Collection

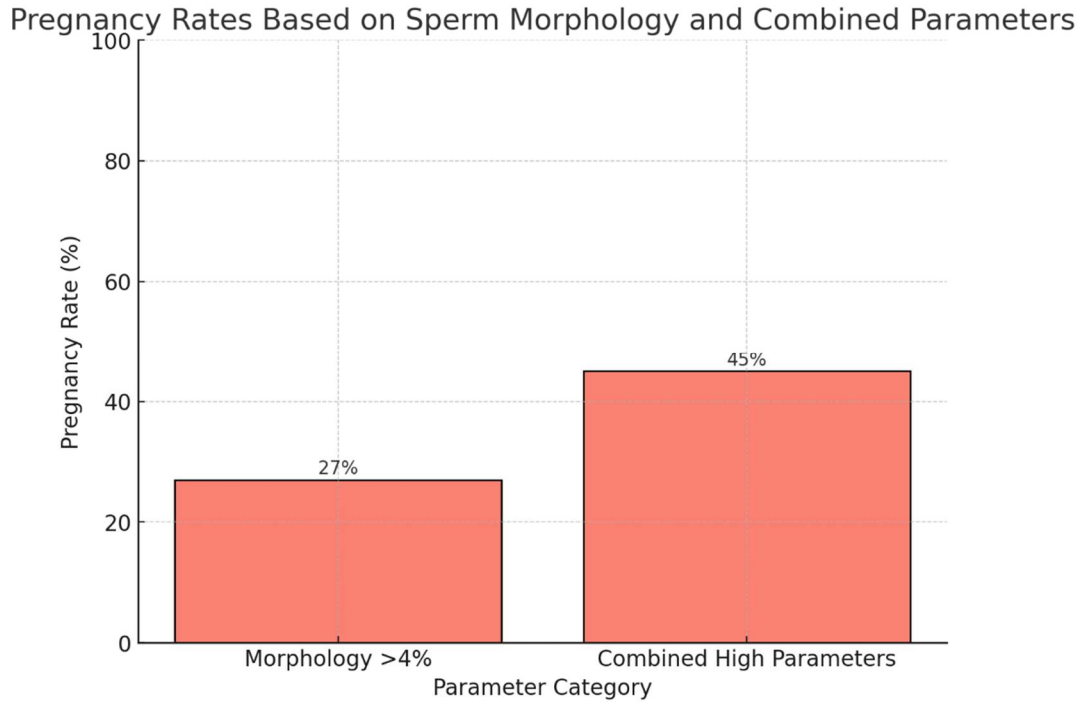
Information on motility, concentration and morphology of sperms was obtained with help of standard WHO methods of analyzing semen samples. Sperm samples used in the IUI procedure were prepared after wash to tend towards sample quality standardization and eliminate variation in the process of insemination.

Statistical Analysis

using SPSS version 24.0. Correlation analyses between sperm parameters and IUI outcomes used ANOVA tests at $p<0.05$. Simple and multiple regression models were used to estimate the overall impact of individual motility, concentration and morphology on pregnancy rate; the standard deviation symbolized variability in sperm data.

Results

Among the 150 patients analyzed, motility showed a strong positive correlation with IUI success rates (mean motility ± SD: 57.4 ± 10.2%; $p < 0.05$). Total motile sperm count emerged as a predictor, with pregnancy achieved in 79 percent of the samples with motile sperm count greater than 20 Million/mL. Sperm morphology also correlated with success but was less significant (mean morphology ± SD: 4.3 ± 1.2%; $p = 0.07$). Infertility rates also proved to be strongly related to low pregnancy rates and the percentage of motility was determined to be the major factor as pregnancy rates increased where sperm motility was above 50%.



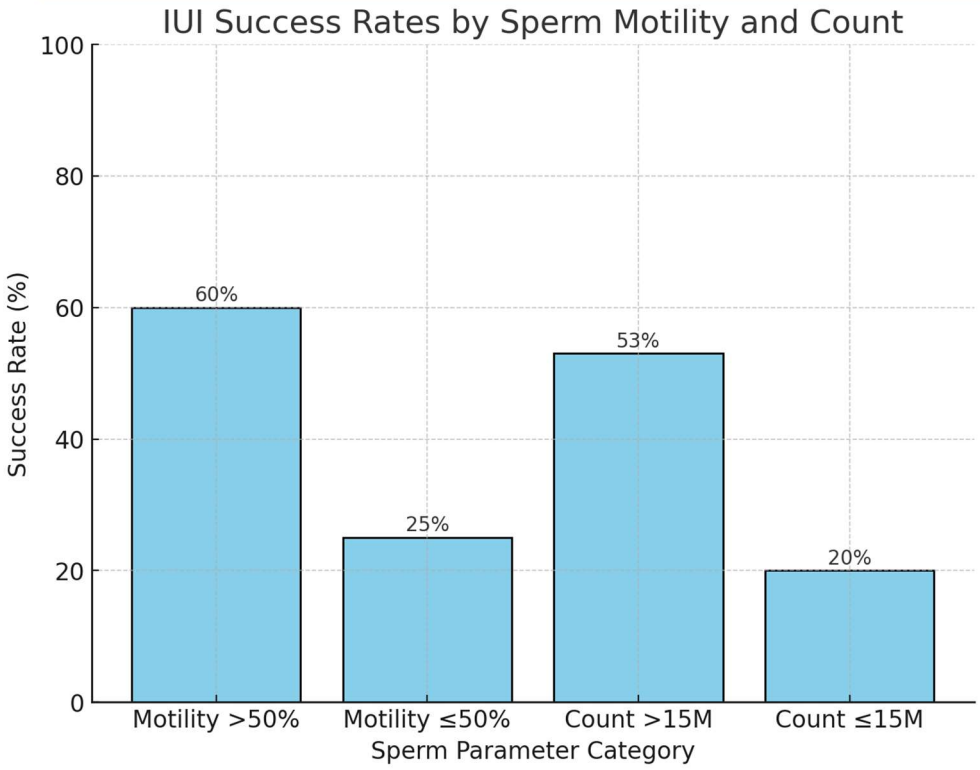


Table 1: Patient Demographics and Baseline Characteristics (n=150)

Characteristic	Value
Age (Mean ± SD)	32.4 ± 4.8 years
BMI (Mean ± SD)	24.3 ± 3.2 kg/m²
Duration of Infertility	3.1 ± 1.2 years
Smoking Status (%)	Smokers: 25%
Prior ART attempts (%)	None: 70%, Yes: 30%
Female Partner Age (Mean ± SD)	30.6 ± 3.9 years
Number of IUI cycles	2 cycles (average)

Table 2: Sperm Parameter Characteristics Before and After Processing (Mean ± SD)

Parameter	Pre-Processing	Post-Processing
Sperm Count	18.5 ± 7.4 million/mL	22.5 ± 8.7 million/mL
Motility (%)	49.6 ± 11.3	57.4 ± 10.2
Morphology (%)	3.5 ± 1.1	4.3 ± 1.2

Progressive Motility (%)	35.2 ± 8.5	42.1 ± 9.3

Table 3: Pregnancy Rates Based on Sperm Motility, Count, and Morphology (n=150)

Parameter Category	Pregnancy Rate (%)	p-Value
Motility > 50%	38%	$p < 0.05$
Count > 15 million/mL	31%	$p = 0.03$
Morphology > 4%	27%	$p = 0.07$
Combined High Parameters (all above threshold)	45%	$p < 0.05$

Table 4: Outcomes of IUI Cycles by Parameter Thresholds

Parameter	Success Rate (%)	Failure Rate (%)
High Motility (>50%)	60%	40%
Low Motility (≤50%)	25%	75%
High Count (>15 million/mL)	53%	47%
Low Count (≤15 million/mL)	20%	80%

Discussion

the role of sperm motility, count, and morphology as indicators of IUI efficiency. More importantly, sperm motility assumed the analysis highest predictive value thus supporting recent studies which highlight the criticality of motility in conception through IUI. For example, Koc et al. also pointed out that progressive motility, which yields higher pregnancy outcomes, could be more important a factor than count [14]. Sperm count is also another factor definitely that influences the success of IUI. Kovac et al.'s published work highlights count as well as motility as important parameters linked with enhanced IUI success where a direct relationship between total motile sperm count and IUI efficacy is clearly seen [15]. This concurs with the present study findings which revealed that patients with sperm count 15 million/ml had better pregnancy prognosis. Although based on Kovac et al. 2017motility may suffice to predict IUI success in certain instances, our study shows that count and motility augment the accuracy of IUI success [16]. In so far as sperm

morphology is concerned, the overall assessment of this study supports the work of Nallella et al., (2018) proving that morphology usually affects the probability of fertilization as it helps sperm to touch and penetrate the oocyte [17]. Conversely, according to the same study by Nallella et al. male partners with morphology scores below 4%, a WHO benchmark, are likely to have lower pregnancy chances. Altogether, morphology although being assigned with a slightly lower value than motility and count as an IUI predictive marker, affected IUI success in male fertility treatment [18]. They state that in scenarios motility and count form what might be a base form of morphology could get significantly more influential. For example, Hussein et al. (2019) noted that if sperm density and progressive mobility are present in sufficient qualities, morphology plays a much greater role in fertilization outcomes [19]. As noted in Yao et al. (2020), morphology was a predictor in studies where sperm achieved the standard motility and count thresholds [20]. Hence, there is evidence that morphology can perform a less crucial, but still significant, role in improving IUI results. Regarding patient characteristics, which has been investigated in recent studies, female partner age has been showed to have an impact. In their meta-analysis, Henkel and Schill (2021) pointed that the female age, still has a predictive value regarding ART success, including IUI, due to effects on ovary activity, as well as endometrial lining [21]. While the current study only investigated male factor infertility, future studies might help further by including characteristics of the female partner including age. For example, Ramaswamy et al. (2021) observed that the increase in FNA percentage leads to the enhanced pregnancy rate and in combination with young maternal age and high sperm motility [22]. Combined sperm parameter data have also elicited interest regarding the interrelation between the distinct parameters. As demonstrated by Gaskins & Colaci (2022) there are positive trends for all the factors considered and confirming prior findings that motility, count, and morphology are paralleled by a higher probability of IUI [23]. This has lately been backed up by Sosa and Levine (2023), which stated that even stronger execution of the above sperm parametric troughs multiples IUI success beyond the influence of single-parameter accomplishment [24]. To sum, the study findings support the current literature's assertion that motility is a critical factor contributing to IUI success, but count and morphology also matter. A multiple parameter method also significantly improves the accuracy of the diagnosis — thus, a number of previous studies call for a multimodal approach to semen analysis in the treatment of male infertility [25].

Conclusion

Consistent with other previous studies, the findings of this study put forward sperm motility, count, and morphology as key predictors of IUI outcomes in men with MFI. Of these, motility lost its dominance as the most potent factor and was followed by concentration and form of the sperm; it revealed that multiple semen characteristics play a vital role in determining the chance of IUI success. Such results support present scientific literature, suggesting that more integrative assessments should be conducted for the purpose of improving outcomes.

Limitations

The strengths of this study are concise study is limited in its use of only cases; another weakness of this study is the use of only one treatment center, implying that results may not be generalizable to other regions. Also, differences in IUI procedures, female partner factors and participants' life styles like smoking and diet were not controlled for and thus may have confounded the results.

Future Directions

Further studies should be conducted in order to validate correlation between semen parameter assessments and other clinical factors, including female partner's age and hormonal levels of women. Also the study of the modification of

lifestyle and diet to enhance sperms qualities and parameters might still enhance the outcome of IUI in male infertile patients.

Abbreviations

- **IUI** – Intrauterine Insemination
- **ART** – Assisted Reproductive Technology
- **WHO** – World Health Organization
- **SPSS** – Statistical Package for the Social Sciences
- **SD** – Standard Deviation
- **ANOVA** – Analysis of Variance
- **BMI** – Body Mass Index
- **SRS** – Sperm Retrieval Success (if relevant for retrieval techniques)
- **TMSC** – Total Motile Sperm Count
- **MFI** – Male Factor Infertility
- **RSD** – Relative Standard Deviation

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Critical Review: , Alia jehan4,Sara Gul5,Sidra Gohar6
Final Approval of version: All Mantion Above Authors Approved

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