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**Original Research Article**

# Study of various predictors influencing success with artificial insemination husband

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## ABSTRACT

**Background:** Infertility effects more than 180 million people world-wide and couples should be evaluated to focus on the modifiable factors and various interventions to optimize the results before switching to costly treatments. Artificial insemination husband is one such treatment where various prognostic factors determine the success.
**Methods:** The present study was done in department of reproductive medicine and surgery GSL medical college .All infertile couples attending the clinic and satisfying inclusion and exclusion criteria after proper consent were enrolled for study. Various relevant prognostic factors determining outcome were analysed statistically using the chi square test, the Fischer exact test, and the one way ANNOVA test.
**Results:** In present study, the prevalence of positive pregnancy after IUI procedure was 14.7%. The total pregnancy rate per cycle was 10.6%. Among prognostic factors total motile sperm count, semen preparation technique and first AIH cycle showed positive correlation with the outcome.
**Conclusions:** According to the results of the current study, intrauterine insemination (IUI) can provide many infertile couples with an opportunity of parenting. Before beginning this type of therapy, it is crucial to make the right selection of cases and conduct a thorough assessment of the couples.

**Keywords:** AIH, Factors, Infertility, Influence

## INTRODUCTION

Infertility is usually defined as the inability of a couple to conceive even after one year of unprotected, frequent sexual intercourse.[1] It affects about 15% of all couples in the United States and at least 180 million worldwide.[2] Male infertility is defined as the inability of a male to make a fertile female pregnant, also for a minimum of at least one year of unprotected intercourse. About 20% of all cases of infertility are entirely the male's factors.[3] It's critical that both partners undergo infertility testing and treatment together because male and female reasons of infertility frequently coexist. About 50% of all cases of infertility are primarily caused by the male factor.

Male fertility can arise for a variety of causes, including both reversible and irreversible diseases. Age, drugs, surgical history, exposure to environmental pollutants, genetic issues, and systemic disorders might all have an impact on any of the partners. The important purpose for assessing a male for infertility is to recognise the contributing factors, determine if assisted reproductive techniques (ART) needed and provide counselling for irreversible and untreatable conditions.[4]

Artificial insemination with the husband's semen (AIH) is an economical and noninvasive method of infertility treatment; the optimized semen is delivered directly into the female uterine cavity to achieve a pregnancy.[5,6] However, AIH's pregnancy rate is much lower than in

vitro fertilization (IVF) as its multiple and complex uncertainty factors.[7,8] The present study is conducted to study various factors that influence pregnancy outcome in Artificial Insemination Husband (AIH).

Infertility occur from male factor alone in approximately 20% of the times though the epidemiological evidence is constrained.[9,10] IUI is a successful treatment alternative for male factor infertility.[11] Yet when other infertility etiologies are presumed, paternal factors such as total motile count (TMC), post wash sperm count and DNA Fragmentation Index (DFI) are significant considerations in predicting IUI success rates.

***Post-wash sperm count***

The predictive value of post-wash TMC in relation to the successul intrauterine insemination (IUI) has been investigated. Multiple studies have observed a threshold value of 1 million.[12-14] Nevertheless, a study of 3200 women who underwent a total of 9963 cycles revealed that a higher threshold value was observed, resulting in reduced pregnancy rates when number of inseminated sperm was less than 2 million.[15]

***Paternal age***

Extensive documentation exists regarding the adverse effects of increasing maternal age on fertility. The potential impact of increasing paternal age, particularly beyond 40 years, on reproductive outcomes such as higher rates of preterm birth, spontaneous abortion, autism spectrum disorders, and infertility has been suggested. However, the observed effects of paternal age on these outcomes vary across multiple cohort studies, leading to inconsistent findings.[16-19]

***Paternal BMI***

The investigation of correlation between paternal BMI and fertility has gained momentum because of escalating obesity burden among general population. Cohort studies showed significant reductions in these considerations are observed in men with a BMI of 25 or higher, with the most pronounced effects observed among men with a BMI of 30 or higher.[20–23]

***Maternal factors affecting pregnancy outcomes***

Patients often pursue infertility treatment for various reasons. It is noteworthy that approximately 37% of infertility cases can be attributed solely to female factors, while a range of 30-40% of infertility cases are affected by a combination of both male and female factors.[24]

*Age*

The phenomenon of ageing in women has been observed to have a detrimental effect on fertility, primarily due to two factors: decreased ovarian reserve and heightened occurrence of aneuploidy.

*BMI*

The condition of obesity has been found to elevate the likelihood of experiencing reproductive complications, such as infertility resulting from menstrual dysfunction and oligo-anovulation.[25,26]

*Race/ethnicity*

There are noteworthy disparities which are prevalent throughout the healthcare system, whereby various factors, including socioeconomic status, race, and ethnicity, exert an influence on health outcomes.[27] Asian and Hispanic women, among other minority groups, experience longer durations for infertility evaluation and may exhibit distinct factors that impact the development of infertility, in contrast to their white counterparts.[28-30]

*Infertility diagnosis*

Various retrospective studies conducted to explore the effect of infertility diagnosis on the outcomes of intrauterine insemination (IUI). In their study, Sahakyan et al. conducted an evaluation of 613 gonadotropin ovarian stimulation (OI) and intrauterine insemination (IUI) cycles. The researchers observed the cumulative pregnancy rates after six cycles for different patient groups, including those with ovulatory dysfunction, unexplained infertility, endometriosis, and tubal factor infertility. The results found that ovulatory dysfunction achieved a cumulative pregnancy rate of 84%, while patients with unexplained infertility, endometriosis, and tubal factor infertility achieved rates of 57%, 38%, and 20% respectively.[31]

***Cycle factors affect pregnancy outcomes***

*Stimulation regimen*

Accepted treatment protocols for ovulatory dysfunction and infertility encompass the utilisation of clomiphene citrate (CC), letrozole, and gonadotropins. CC is classified as a selective oestrogen receptor modulator (SERM) that functions by engaging in competition with oestrogen for binding to the oestrogen receptors located in the hypothalamus. This interaction results in a reduction of negative feedback to the hypothalamus. This process leads to an increase in the secretion of Gonadotropin-Releasing Hormone (GnRH) in the hypothalamus, which in turn stimulates the release of gonadotropins, thereby promoting ovarian stimulation.[32,33]

*Ovulation medication and timing*

In women who have normal ovulation patterns, intrauterine insemination (IUI) can be carried out using either a natural luteinizing hormone (LH) surge or an

artificial ovulation trigger known as human Chorionic Gonadotropin (hCG). A retrospective study compared the measurement of a spontaneous luteinizing hormone (LH) surge in urine to the administration of a human chorionic gonadotropin (hCG) trigger in natural cycles.[34] Additionally, a randomised study compared the measurement of a spontaneous LH surge in urine to clomiphene citrate (CC)-stimulated cycles. Both studies observed similar pregnancy rates when comparing the use of urinary LH measurement to the use of an hCG trigger.[35] The preceding study did not observe any statistically significant disparities in live birth rates, while the subsequent study did not identify any notable distinctions in cumulative pregnancy rates across a span of three cycles.

*Cycle number*

According to the majority of researchers, it is advisable to consider in vitro fertilisation (IVF) after undergoing three to four cycles, as the highest likelihood of achieving pregnancy typically occurs within the initial four intrauterine insemination (IUI) cycles.[36]

*Insemination procedure*

There are several practise variations that exist in the procedure of insemination. In stimulated cycles, the timing of insemination exhibits a range of 24 to 40 hours following hCG injection, and there is no discernible impact on pregnancy rates.[37–40] Consequently, the precise timing of insemination can be determined based on the preferences of both the healthcare provider and the patient. In accordance with natural physiological patterns, it is recommended to conduct intrauterine insemination (IUI) approximately 24 hours subsequent to the occurrence of the luteinizing hormone (LH) surge.[41]

Objectives of this study were to evaluate various prognostic factors associated with successful Artificial Insemination Husband (AIH), to estimate clinical pregnancy rate per cycle of artificial insemination husband, and to estimate pregnancy rate per infertile couple undergoing artificial insemination husband.

## METHODS

### *Study design*

The current study was a prospective observational study. This study was conducted in the Department of Reproductive Medicine and Surgery of GSL Medical College and Hospital.

### *Study duration*

The present study was conducted during the period of 24 months from 1st May 2021 to 1st May 2023.

### *Study population*

All the couples with infertility attending the Department of Reproductive Medicine and Surgery.

### *Sample size*

As it was a pilot study all couples who visited the department during the study period for AIH were included in the study.

### *Inclusion criteria*

*Male factors*

Patients with mild and moderate oligozoospermia (sperm concentration 5-20×$10^6$/ml), mild asthenozoospermia (<50% sperms showing fast forward and slow progressive motility), mild teratozoospermia (morphologically normal sperm 4-15% according to WHO 5th edition guidelines) and defects of penis like hypospadias were included.

*Female factors*

Patients with age of female between 20-40 years, chronic anovulatory cycles, PCOS, hypothyroidism, hyperprolactinemia, minimum to mild endometriosis, unexplained infertility, single fallopian tube, and cervical factor were included.

### *Exclusion criteria*

*Male factors*

Patients with azoospermia, severe oilgoasthenoteratozoospermia (sperm density <5 × $10^6$/ml, no motile sperms in the sample, <4% sperm morphologically normal according to WHO 2010), erectile dysfunction and retrograde ejaculation and anejaculation were excluded from this study.

*Female factors*

Patients with moderate to severe pelvic endometriosis, bilateral tubal blockage, and pelvic tuberculosis were excluded from this study.

The study received approval from the institutional human ethics committee. All study participants were required to provide informed written consent, and only those who willingly signed the informed consent were included in the study. The potential hazards and advantages associated with the research, as well as the voluntary aspect of participation, were thoroughly elucidated to the participants prior to obtaining their informed consent. The preservation of confidentiality for the participants involved in the study was maintained.

***Steps followed in IUI***

After counselling, consent, baseline investigations and ascertain to cause by various investigations, controlled ovarian stimulation was started on D2 by oral ovulogens followed sequentially by injectable gonadotropins. The dose of these ovulation induction drugs was fixed depending upon the weight and previous response to stimulation. On Day 2 transvaginal USG was conducted to measure endometrial thickness and antral follicle count. Serial USG was done from D10 onwards after every 2/3 days to measure endometrial thickness, number of follicles and their size. When dominant follicle size reached more than 18 mm, trigger was given with 10000IU of HCG. IUI cycle was cancelled if more than three dominant follicles are present to avoid OHSS syndrome.

Then after 36 hrs, following HCG trigger, TVS was done to ascertain the follicular rupture and secretary changes in the endometrium. Couple was prepared for IUI. Semen was collected for preparation and after desired technique of either density gradient or swim up, women is put in dorsal lithotomy position and inseminated with 0.3 ml of post wash sperm. Patient was asked to rest for 20 minutes before going home started with progestational support. If a female misses her periods, urine pregnancy test was done, if positive it was confirmed by serum beta HCG report. TVS was done to localize gestational sac. Viability was confirmed by fetal heart at around seven weeks.

***Statistical methods***

Descriptive analysis was performed on quantitative data using mean and standard deviation, and categorical variables using frequency and percentage. Data was also displayed graphically using appropriate diagrams such as bar graphs, pie charts, and box plots.

All data was entered into an MS Excel spreadsheet, and statistical analysis was performed using IBM SPSS 21.0 software, with a P value of 0.05 considered significant using the chi square test, the Fischer exact test, and the one way ANNOVA test.

## RESULTS

In present study, the prevalence of positive pregnancy after IUI procedure was 14.7% (Figure 1).

The total pregnancy rate per cycle was 10.6%. (48 positives in 453 cycles). Most of the study population had duration of marriage less than five years (Figure 2).

In current study, among patients with positive pregnancy 77.1% had primary infertility and 22.9% had secondary infertility (Figure 3).

Most of the study population had anovulatory cause of infertility followed by oligoasthenoteratozoospermia, unexplained infertility and lastly single fallopian tube (Figure 4).

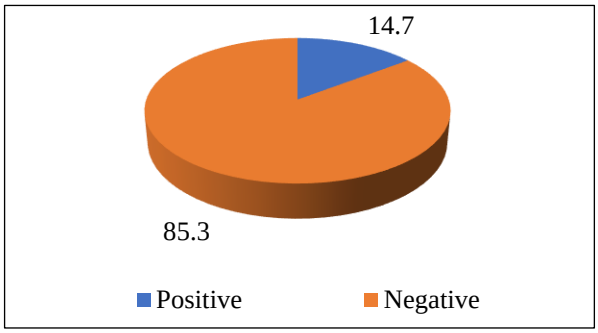


**Figure 1: Pie chart showing distribution of study participants according to the outcome.**

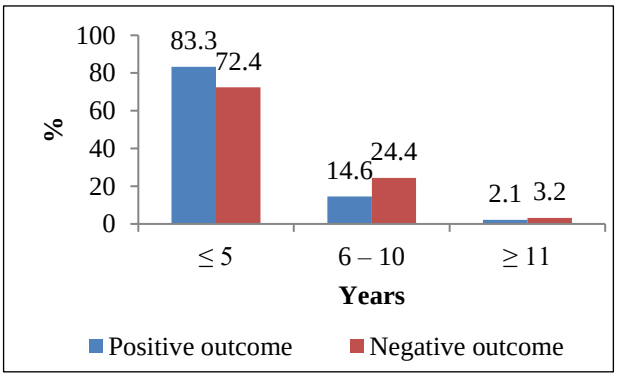


**Figure 2: Cluster bar chart showing distribution of study participants according to duration of marriage.**

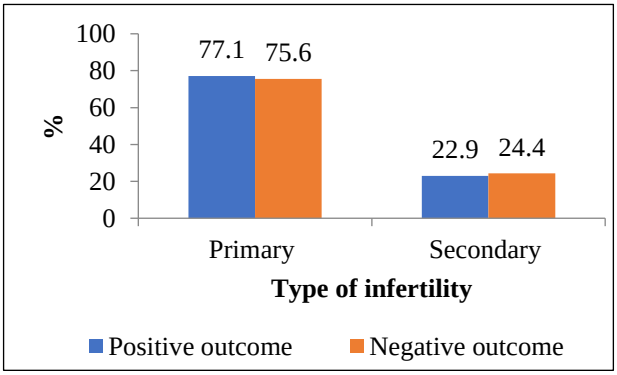


**Figure 3: Cluster bar chart showing distribution of study participants according to the type of infertility.**

The overall mean age male participants was 32.99±4.65years.In present study, majority of husbands with positive outcome belong to age group of 26 to 30years (41.7%) followed by 29.2% belong to age group of 26 to 40years, 27.1% belong to age group of 31 to 35years and 2.1% belong to age group of less than 25years with mean age of 32.29±4.36years (Figure 5).

The overall mean age of female participants was 27.83±4.68years. In current study, majority of female

patients with positive outcome belong to age group of less than 25years (43.7%) followed by 39.6% belong to 26 to 30years and 16.7% belong to age group of 31 to 35years with mean age of 26.63±4.05years (Figure 6).

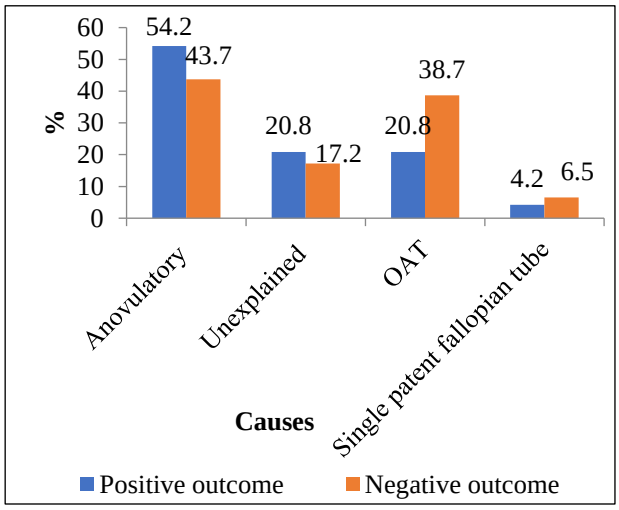


**Figure 4: Cluster bar chart showing distribution of study participants according to cause of infertility.**

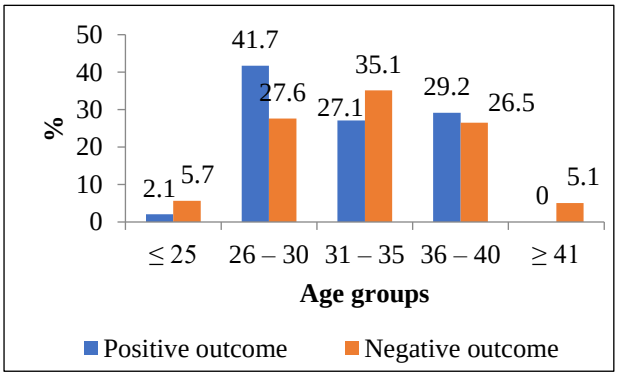


**Figure 5: Cluster bar chart showing distribution of study participants according to age of husband.**

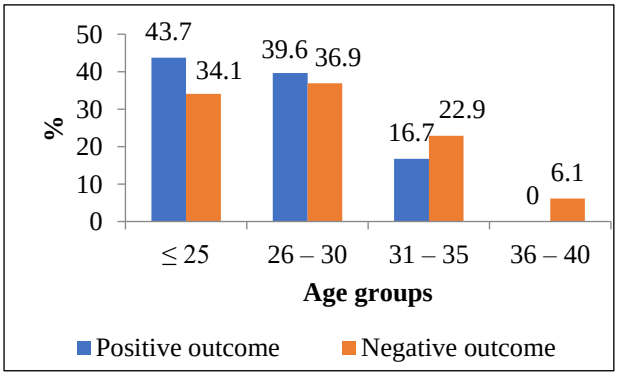


**Figure 6: Cluster bar chart showing distribution of study participants according to age of wife.**

In current study, among the patients of 1st cycle, 17.1% got pregnancy positive and 82.9% were negative, among the patients of 2nd cycle, 4.9% got pregnancy positive and 95.1% were negative, among the patients of 3rd cycle, one patient got pregnancy positive and among the patients of 4th cycle all the patients were negative where there was statistically significant higher rate of positive pregnancy in 1st cycle (P value 0.000) (Figure 7).

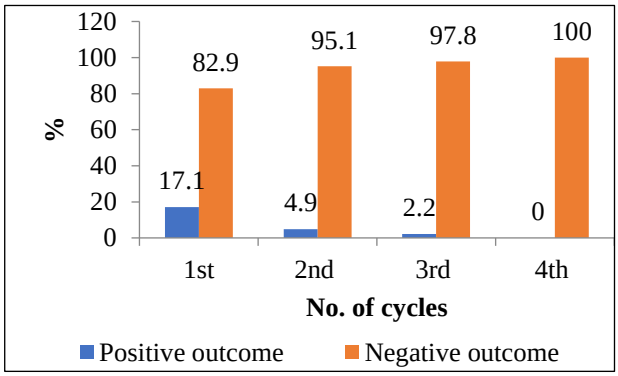


**Figure 7: Cluster bar chart showing distribution of study participants according to number of cycles of IUI.**

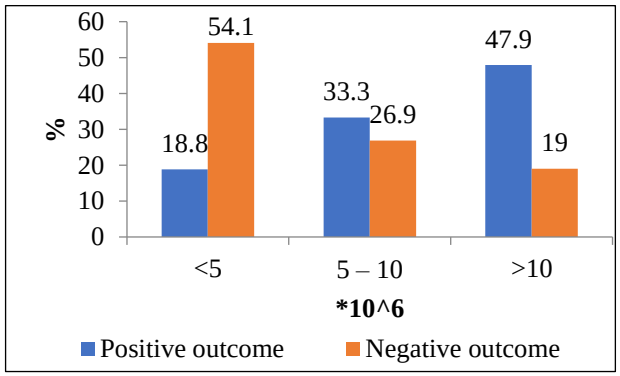


**Figure 8: Cluster bar chart showing distribution of study participants according to total motile sperm count.**

In current study, among patients with positive outcome, majority of patients (47.9%) had post wash motile sperm count of more than 10×106 followed by 33.3% had post wash MSC of 5 to 10×106 and 18.8% had post wash MSC of less than 5×106 whereas among patients with negative outcome, majority of patients (54.1%) had post wash MSC of less than 5×106 followed by 26.9% had post wash MSC of 5 to 10×106 and 19% had post wash MSC of more than 10×106. There was statistically significant higher post wash motile sperm count among patients with positive outcome when compared with patients with negative outcome (P value <0.001) (Figure 8).

Amongst patients with positive outcome in the current study, 64.6% had density gradient semen preparation and 35.4% had swim up semen preparation whereas amongst patients with negative outcome, 88.5% had density gradient semen preparation and 11.5% had swim up semen preparation. Statistically significant higher prevalence of positive pregnancy was noted among patients in whom

density gradient semen preparation was the method employed for semen preparation when compared with swim up as the method used for semen preparation (P value 0.000) (Figure 9).

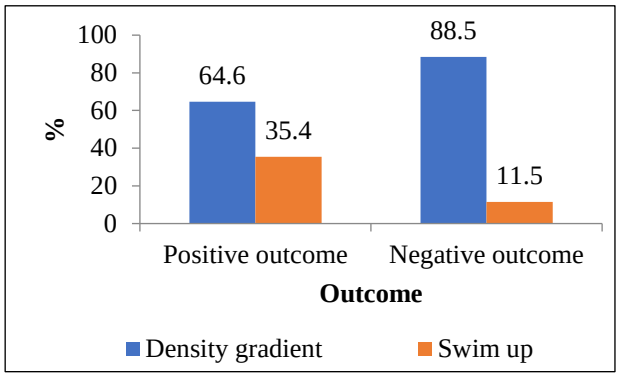


**Figure 9: Cluster bar chart showing distribution of study participants according to method of semen preparation.**

In current study, majority of patients (52.1%) had 2 dominant follicles followed by 25% had single dominant follicles and 22.9% had 3 dominant follicles with positive outcome. There was no statistical significance (P value 0.592).

## DISCUSSION

Parenthood is frequently seen as the next phase in a couple's family life after marriage. They can't fathom that having a child or becoming "mom" or "dad" would be challenging or that it might not happen naturally. They are surprised when multiple attempts to get pregnant fail. Their fundamental presumption about family life is upset. The majority of couples are in serious need of medical therapy, which can only lead to suffering. This is obviously not a struggle for survival; rather, it is a struggle to realize a goal and live what they define as a "full life". Until the specifics of the variables that affect treatment result are known, the full benefits of IUI might not be realized. Patient selection is one of these factors, as improper administration of this therapy to the entire population of infertile couples will compromise its effectiveness. Most women will be pregnant during the first 3-4 cycles of IUI if the procedure is used wisely and completely. Age, infertility type, length, follicular count, semen quality, and endometrial receptivity all affect a treatment's outcome. Therefore, those who are unsuccessful within this time frame should be reevaluated with the intention of offering them IVF.

The technique for semen preparation is a very important move in success of IUI. It separates a significant amount of motile, morphologically healthy spermatozoa, which are vital for both IUI and any ART. It's crucial to time insemination correctly because IUI around ovulation is related to the highest pregnancy rate. 4-6 rounds of IUI with or without controlled ovarian hyperstimulation (COH) to be made available, taking into account the patient's diagnosis, age, financial situation, and preferences.

In present study, the prevalence of positive clinical pregnancy after IUI procedure was 14.7%. Among the 48 clinical pregnancies, 1 patient had ectopic pregnancy.

***Semen preparation method***

In current study, among positive outcome patients, 64.6% had density gradient semen preparation and 35.4% had swim up semen preparation whereas among patients with negative outcome, 88.5% had density gradient semen preparation and 11.5% had swim up semen preparation. There was statistically significant higher prevalence of positive pregnancy among patients with density gradient semen preparation when compared with swim up semen preparation (P value 0.000).

Study by Hatice et al showed that there was statistically significant higher prevalence of positive pregnancy (19%) in density gradient semen preparation when compared with swim up (9.7%) semen preparation (P value <0.05).[42]

***Post wash motile sperm count***

In current study majority of patients (47.9%) had post wash motile sperm count of more than $10\times10^6$ followed by 33.3% as 5 to $10\times10^6$ and 18.8% of less than $5\times10^6$ whereas among patients with negative outcome, majority of patients (54.1%) had post wash motile sperm count of less than $5\times10^6$ followed by 26.9% as 5 to $10\times10^6$ and 19% of more than $10\times10^6$. There was statistically significant higher post wash motile sperm count among patients with positive outcome when compared with patients with negative outcome (P value <0.001). Our results are in sync with other studies done by Ishita et al, Shiuan et al, Roshan et al.[43-45]

***Number of cycles***

In current study, among the patients of 1st cycle, 17.1% got pregnancy positive and 82.9% were negative, among the patients of 2nd cycle, 4.9% got pregnancy positive and 95.1% were negative, among the patients of 3rd cycle, one patient got pregnancy positive and among the patients of 4th cycle all the patients were negative and significantly higher rate of positive pregnancy in 1st cycle (P value 0.000). Total pregnancy rate per cycle was 10.6%. (48 positive pregnancy in 453 cycles).our results are similar to research done by Ishita et al, Mina et al.[43,46]

## CONCLUSION

According to the results of the current study, intrauterine insemination (IUI) can provide many infertile couples with an opportunity of parenting. Before beginning this type of therapy, it is crucial to make the right selection of cases and conduct a thorough assessment of the couples. The

likelihood of getting pregnant following an IUI depends on a few different things. When choosing IUI as an option for treatment and providing couple's therapy, these things should be taken into consideration. The length and type of infertility, as well as the ages of the spouses (especially the woman), May all be associated with a successful IUI procedure. The male factor assessment is crucial when considering IUI utilizing the husband's washed sperms. Especially for the earliest seminal parameters, this holds significant. The result will be higher with the better the seminogram. To calculate TMSC (total motile sperm count), it is best evaluated in the post-preparation sample right before IUI. Due to the short duration and small number of patients in this study, there is a good opportunity that should focus our attention to larger studies in the future with a sizable patient population and adequate resources to reach a firm conclusion.

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