Assessment of Male infertility among iraqi populations

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summary :-

Failure to achieve pregnancy within a year of attempting conception can often be attributed at least partially to male factors in around half of infertile couples. Assessing the male partner is crucial for guiding therapy effectively, as some conditions may respond to medical or surgical intervention while others may require alternative options like donor sperm or adoption. It's important to evaluate the male partner to tailor treatment plans appropriately, considering both the health of the patient and potential implications for offspring. This guideline aims to outline the proper evaluation and management of male infertility within couples, starting with a thorough history, physical examination,

and diagnostic testing, and covering various treatment options such as medical therapies, surgical procedures, and assisted reproductive technologies like IUI, IVF, and ICSI. Infertility in males can be caused by varicocele, genital infections, endocrine disruptors, genetic and immunological and systemic illnesses as well as environmental causes.

Introduction:-

Infertility has emerged as a health issue affecting around one in ten couples. It is estimated that 48.5 million couples who engage in intercourse face the challenge of involuntary childlessness. Male infertility alone accounts for 60% of this problem and has become a significant concern for public health. The prevalence of infertility varies from 2.5% to 12%, across regions globally.

The reported cases may actually be higher than what's documented as there is a lack of data and underreporting in certain cultures and communities where men are reluctant to undergo clinical evaluations. Unfortunately despite these realities the field of andrology often receives inadequate attention. It is quite common for an infertility specialist to be a gynecologist with knowledge or experience in assessing infertility. Frequently the diagnosis of infertility relies solely on a laboratory parameter from the semen analysis, which ultimately determines the treatment approach for the infertile man. Consequently it seems that it is not the patient who receives treatment but their sperm that becomes the primary focus. However it is important to note that in cases a semen analysis alone does not provide information regarding the underlying cause of infertility. Male infertility can be caused by factors. It's often difficult to pinpoint a specific cause that can be treated or corrected.

Sometimes the only indication of infertility is a semen analysis leading to the term "for cases where the cause is unknown or unexplained. Detecting genetic disorders in the male infertility evaluation plays a vital role in counseling couples about potential risks to offspring, guiding informed decisions on treatment strategies. Additionally, uncovering serious conditions like testicular cancer or pituitary tumors is crucial, as infertility and sexual dysfunction may be their sole initial symptoms during an assessment. This underscores the importance of a comprehensive approach to male infertility investigations for both reproductive and broader health considerations

The aim of study :- The aim of male infertility evaluation is to identify and treat potentially correctable cause

Evaluation of Male Infertility :-

The primary and crucial test for men still revolves around the semen analysis, (sperm count). However, it's important to note that a poor semen analysis or low sperm count doesn't necessarily eliminate the possibility of natural conception. Conversely, a normal sperm count doesn't guarantee that a husband's sperm can fertilize his wife's eggs. Surprisingly, men with remarkably low sperm counts sometimes face no challenges in impregnating their wives. On the flip side, in a small percentage of in vitro fertilization

(IVF) cycles where the semen analysis is entirely normal, fertilization may not occur. Often, what may initially appear as a “male factor” issue could potentially be linked to a female factor or an unknown variable.. Determining the quantity and quality of sperm required for a man to be fertile is a complex matter. About forty years ago, there was a belief that a sperm count below 40 million spermatozoa per milliliter indicated infertility. Urologists often provided couples with such a diagnosis a discouraging outlook for pregnancy. Interestingly, when pregnancies did occur, the success was typically attributed to the treatment administered to the supposedly infertile husband, even if it was not truly effective.. Recognizing the possibility of fertilization with low sperm counts, the World Health Organization (WHO) in 1992 revised “normal values” for semen analysis. These included a sperm concentration greater than 20 million per milliliter and a total sperm count of 40 million per ejaculate, along with 50% of sperm showing forward progressive motility and 30% with normal morphology. When a couple struggles to achieve pregnancy over a specified period, like 1 or 2 years, it indicates infertility. The crucial question then becomes the extent to which the husband’s “deficient” or “abnormal” sperm count contributes to or doesn’t affect the couple’s infertility.

Semen analysis:-

The normal ranges for each procedure, according to the World Health Organization, are:

- Volume: Greater than 1.5 milliliters (mL)
- pH, or acidity: 7.2 to 7.8
- Sperm count: 39 million sperm per ejaculate or more)
- Sperm progressive motility, or the ability to move rapidly: Greater than 32% actively moving
- Sperm morphology, or the sperm's shape and size: Greater than 4% normally shaped.

If your results are different, you may have decreased fertility. But it's possible for men with lower sperm counts to be fertile, and men with high sperm counts to be subfertile. Semen analysis plays a crucial role in understanding male fertility, serving as the initial step in assessing couples facing fertility issues. This test, being noninvasive and cost-effective, is typically the starting point in fertility evaluations. Incorrect results may lead to unnecessary and costly treatments or a misplaced focus on the wrong partner. Beyond fertility, semen analysis is valuable in assessing reproductive toxicant exposure and monitoring contraception effectiveness post-interventions like vasectomy, emphasizing its broader significance in both health and family planning. Semen analysis does not test for a solitary analyte but is actually a panel of tests that measure many organ and gland functions , each requiring different technologies and skills. Semen is the composite product of fluids and cells from the testes and the male accessory glands, and contains primarily the following key elements:

(1) a minute amount of clear mucoid secretions from the bulbourethral (Cowper's) glands that serve to lubricate the urethra and neutralize any residual acidic urine;

(2) a small amount of acidic secretions from the prostate that contain zinc, citric acid, acid phosphatase, and prostate-specific antigen (PSA);

(3) secretions from the cauda epididymidis and vas deferens that contain spermatozoa;

(4) alkaline secretions from the seminal vesicles that constitute most of the semen volume and contain fructose, prostaglandins, and seminogelin proteins... Semen analysis is performed primarily in two types of

settings: (1) general reference or hospital pathology clinical laboratories, where most of the initial screening is performed, and (2) andrology or fertility laboratories for more intense analysis, usually in a fertility treatment setting. Some post-vasectomy screening is still performed in physicians' offices, but the medicolegal environment, regulatory compliance, and certification costs have made many physicians unwilling to provide laboratory results.

Nomenclature for semen variables

Normozoospermia	Normal ejaculate
Oligozoospermia	Less than 20x106/ml of sperm in the sample
Asthenozoospermia	Fewer than half of spermatozoa progress forward (categories a and b) or fewer than a quarter of spermatozoa progress ahead
Teratozoospermia	Normal-looking spermatozoa in less than 30% of cases
Oligoasthenoteratozoospermia	Disturbances in any or all three (combination of only two prefixes can be used)
Azoospermia	The ejaculate had no sperm
Aspermia	Ejaculate is not present.

Microscopic examination

Next, the semen should be examined microscopically for the presence of bacteria, round cells, debris, agglutination (adherence of motile sperm to other sperm), or aggregation (adherence of sperm to other cells or debris).

To achieve this, a small drop or a 10 μL portion of the semen is placed on a glass slide and covered with a coverslip, creating a "wet preparation." Alternatively, it can be conducted concurrently with sperm counting using a chamber that doesn't need dilution.

In the analysis, a minor amount of debris, usually anucleate material smaller than a sperm head, is normal in most semen. However, moderate to heavy debris should be highlighted. The presence of bacteria, especially exceeding 1000/mL, might indicate infection, but it could also result from collection contamination or urethral colonization. Sperm agglutination points to antisperm antibodies, and enzymatic treatment can help reduce it for accurate analysis. Round cells encompass leukocytes and immature germinal cells, reported as an average per high-power field or counted with phase microscopy. A peroxidase test can detect polymorphonuclear neutrophils, but not non-PMN leukocytes like macrophages and monocytes, which can make up half of total leukocytes.

In a well-stained semen smear, polymorphonuclear neutrophils (PMNs) are easily identified by their multilobed nuclei connected by nuclear bridges and distinctive cytoplasmic granules absent in sperm precursor cells and other leukocytes. When quantified per 100 sperm, the absolute number can be calculated from the total sperm count. Leukocytospermia, defined as over 1 million total leukocytes/mL or over 500,000 PMN/mL, is observed in approximately 10–20% of infertile men. Interestingly, leukocytes poorly correlate with infection, with only about 20% of specimens showing microbiological positivity. Instead, they commonly indicate an inflammatory response in the epididymis or prostate. Episodic leukocytospermia, linked to acute epididymitis from long-distance cycling, has been noted in sperm donors and may persist chronically in competitive cyclists due to testicular trauma. Leukocytospermia is associated with poor sperm quality due to the production of cytokines, hydrogen peroxide, and reactive oxygen species.

Causes and risk factors of infertility:

It's estimated that 50% of male infertility cases have no identifiable cause. Both genetic and non-genetic factors contribute to male infertility, with previous exposure to illnesses being significant among the non-genetic factors. For instance, men with diabetes are more likely to experience sperm DNA damage, impacting their fertility. Maintaining testicular function requires a temperature 2°C to 4°C cooler than the body temperature. Additionally, a fever of 38°C or higher over six months can disrupt sperm production.

Other causes and risk factors of infertility

1-Primary hypogonadism (40-50%)

2-Aging and obesity

3-Androgen sensitivity

4-Congenital or developmental testicular disorder

5-Medication (alkylating agent, antiandrogens, cimetidine, ketoconazole,

spironolactone).

6- Orchitis including mumps orchitis

7-Radiation.

10-Y chromosome defect.

11-Ten to twenty percent less sperm transfer).

12-Without a vas deferens or any other impediment

13-Epididymal absence or obstruction.

14-Hypogonadism secondary (1% to 2%).

15-As a result of a tumor or external infusion of androgens).

16-Congenital hypogonadotropic hypogonadism.

Immune infertility:-

Spermatogenesis begins at puberty, and sperm are shielded from the immune system by the blood-testis barrier. Breaching this barrier can trigger the immune system to produce antisperm antibodies (ASA), often without a clear cause, although previous trauma, infection, or obstruction can contribute. ASA formation occurs in a significant percentage of men with unexplained infertility, those undergoing infertility evaluations or IVF treatment. Immunoglobulin classes A (IgA) and G (IgG) are the main antibodies involved in male infertility, binding to sperm and reducing fertilization capacity. Studies show varying fertilization rates based on the percentage of sperm bound by these antibodies, with conflicting findings on the significance of their localization on sperm heads or tails. ASA have the ability to disrupt various stages of the fertilization process. In the female reproductive tract, complement proteins in cervical mucus can bind to antibodies, leading to sperm cell lysis, reduced motility, and hindered penetration of cervical mucus. Studies indicate that ASA can decrease the rates of spontaneous and induced acrosome reactions in sperm compared to serum without ASA. Some ASA also inhibit spontaneous sperm capacitation and interfere with the recognition of sperm binding sites on the zona pellucida. Sperm agglutination, or clumping, is the primary semen abnormality associated with ASA presence, but it is time-dependent and rarely involves a significant proportion of motile sperm soon after ejaculation. Additionally, semen contains substances that inhibit the activation of the seminal complement system, which is necessary for the action of immobilizing and apoptogenic ASA. Therefore, it's common to find normal semen parameters in men with immune infertility.

Genetic defects :-

Genetic defects can contribute to male infertility by affecting various aspects of sperm function. Sperm chromosomal abnormalities are more common in men with reduced sperm count, motility, or abnormal sperm morphology. Studies have shown that the rates of chromosomal disomy and diploidy are elevated in infertile men compared to those with normal sperm parameters. Sex chromosomal abnormalities are particularly prevalent in infertile men, occurring 15 times more frequently than in the general population, while autosomal abnormalities are six times more common. In addition to chromosomal abnormalities, gene mutations and polymorphisms are observed in infertile men with apparently normal sperm parameters. Examples include mutations in the CatSper gene 1, involved in sperm hyperactivation, and polymorphisms in the POLG gene, which encodes the catalytic subunit of mitochondrial DNA polymerase. Mitochondrial DNA, regulated by the POLG gene, plays a crucial role in energy production and oxidative stress regulation within sperm cells. Polymorphisms in the POLG gene have been associated with reduced egg penetration and fertilization rates in sperm from infertile men with normal sperm parameters.

Fertilization defects:-

Fertilization involves a series of intricate processes, and defects in any of these steps can impair the fusion of sperm with the oocyte and the formation of the zygote. Capacitation, one of the initial stages of fertilization, involves the natural maturation of sperm as they travel through the female reproductive tract. In vitro, capacitation can be induced by removing seminal plasma and providing specific culture media. During capacitation, sperm undergo various changes, including alterations in membrane composition, membrane potential, intracellular pH and calcium levels, and protein phosphorylation patterns. Researchers have observed low expression of D-mannose receptors in individuals with unexplained infertility, indicating a failure of normal capacitation development. These changes are induced by the efflux of cholesterol and shifts in ion channel and transport activities. Capacitation enhances sperm's ability to fuse with the oocyte membrane and primes it for hyperactivation and the acrosome reaction. Proper hyperactivation (HA) of sperm is crucial for fertilization potential. Hyperactivation involves a change in sperm motility pattern from progressive to one characterized by lateral head displacement, high curvilinear velocity, and large amplitude flagellar waves. This hyperactivated motility enables sperm to navigate through cervical mucus, the cumulus oophorus, and penetrate the dense zona pellucida surrounding the oocyte. Research has shown that the ability of follicular fluid to induce sperm hyperactivation is significantly lower in men with unexplained infertility compared to fertile men.

Adverse effects of environmental,chemicals and drugs on the male reproductive systems

Concerns about decreasing semen quality have led to exploring the impact of environment and lifestyle on male reproductive potential. Over the past 40 years, significant changes in factors potentially linked to semen parameter alterations have occurred. These include the widespread adoption of cell phones, a notable rise in opioid and marijuana consumption, an increase in global cigarette smoking, escalating obesity rates, declining physical activity levels, and heightened environmental pollution. Simultaneously, there has been a substantial increase in global surface temperatures.

Evidence suggests that both overweight and underweight conditions (defined by BMI > 25 kg/m2 and BMI < 20 kg/m2, respectively) can decrease male fertility. Maintaining a healthy BMI between 20 and 25 kg/m2 through a balanced diet and regular exercise is recommended. Additionally, studies indicate that dietary fat can negatively impact semen quantity and quality.

An observational study revealed that moderately physically active men exhibited significantly increased levels of follicle-stimulating hormone (FSH), luteinizing hormone (LH), and testosterone (T) compared to sedentary counterparts. This aligns with expectations, as high T levels are often linked to enhanced energy and muscle strength. Interestingly, some reports indicate that moderate-intensity endurance training can lead to increased free and total T levels shortly after exertion in young healthy men.

Psychological stress has long been associated with idiopathic male factor infertility. Several studies have highlighted a correlation between stress and impaired semen analysis (SA) parameters. Men experience a significant decrease in sperm concentration and semen quality during stressful periods, times of war, self-reported stress episodes, following challenging work situations, or after the recent death of a close family member. These findings underscore the intricate connection between mental well-being and male reproductive health.

Excessive alcohol consumption has been suggested as a risk factor for male infertility, with studies linking ethanol to the central action at the hypothalamus level. Ethanol interferes with the secretion of gonadotropin-releasing hormone (GnRH) and cleavage of GnRH precursor prepro-GnRH, leading to reduced LH and FSH, ultimately affecting spermatogenesis. Additionally, ethanol has a direct inhibitory effect on the pituitary, blocking LH production and secretion, potentially explaining abnormal semen parameters in heavy drinkers.

The nonmedical use of prescription narcotics, such as hydrocodone and oxycodone, holds the second-highest abuse rate among illicit drugs, following marijuana. Men aged 26 to 34 years, 35 to 49 years, and 50 years and older report nonmedical use of prescription pain medication at rates of 8.3%, 4.8%, and 2.4%, respectively. This is particularly significant for men of reproductive age, as narcotics can interfere with spermatogenesis through negative feedback on the hypothalamus, suppressing LH release, decreasing T levels, and amplifying hypogonadism through increased sex hormone–binding globulin levels. This further restricts the pool of bioavailable testosterone

Treatment :-

Treatment of male infertility depends on identifying the underlying cause. Abnormalities found in sperm analysis often warrant referral to a male fertility specialist or reproductive endocrinologist. If there's suspicion of anatomical abnormalities or obstructions, surgical evaluation and management may be necessary.

Hormonal treatment plays a significant role in addressing male infertility, as testosterone secretion and spermatogenesis are key functions of the testes, regulated by the hypothalamic-pituitary-gonadal axis. The primary objective of most male infertility treatments is to maintain this axis to enhance testicular testosterone production. In cases of secondary hypogonadism (hypogonadotropic hypogonadism), treatment depends on the underlying cause. For pituitary insufficiency-related male infertility, the standard treatment involves using human chorionic gonadotropin (hCG) in combination with human menopausal gonadotropin (hMG), purified urinary FSH (urinary-hFSH), or recombinant human FSH (r-hFSH). In cases of infertility caused by hypothalamic disorders, pulsatile gonadotropin-releasing hormone (GnRH) therapy using a portable pump has shown effectiveness. It's important to interrupt testosterone treatment during GnRH therapy and resume it after the therapy concludes. This approach helps optimize hormonal balance and supports spermatogenesis, contributing to improved fertility outcomes.

Several **drugs** are utilized in the treatment of male infertility, targeting various underlying causes:

1. Dopamine Agonists: Recommended for hyperprolactinemia, particularly due to prolactinoma. Cabergoline is often preferred due to its high effectiveness in reducing tumor size, lowering prolactin levels, restoring gonadal function, and reversing infertility. In cases of resistant prolactinomas, increasing the dose to the maximum tolerated level before considering surgical intervention is advised.

2. Aromatase Inhibitors: Used in infertile men with a low serum testosterone to estradiol ratio. Drugs like testolactone and anastrozole can increase testosterone levels and decrease estradiol levels, leading to an improved testosterone to estradiol ratio and semen parameters.

3. Sympathomimetic Agents: First-line treatment for ejaculatory dysfunction, particularly in patients with slowly progressive dysfunction such as diabetic neuropathy. These agents augment smooth muscle contraction but may lose effectiveness over time.

4. Selective Estrogen Receptor Modulators (SERMs): Drugs like clomiphene citrate, tamoxifen, and toremifene act on estrogen receptors, inhibiting the negative feedback mechanism of estrogen at the hypothalamus and anterior pituitary levels. This leads to increased release of gonadotropin-releasing hormone (GnRH), subsequently increasing FSH and LH secretion, testosterone production, and spermatogenesis. Clomiphene citrate is preferred for men with low testosterone levels and normal testosterone to estradiol ratio.

5. Antibiotics and Anti-inflammatory Drugs: Antibiotic treatment for genitourinary tract infections can reduce seminal leukocyte concentration,

improve reactive oxygen species (ROS) generation, and enhance sperm parameters. Nonsteroidal anti-inflammatory drugs (NSAIDs) and COX2 inhibitors, such as rofecoxib, can reduce abacterial leukocytospermia. Treatment with NSAIDs followed by carnitine in cases of elevated seminal leukocytes is associated with further reduction in ROS and improvement in sperm parameters compared to concurrent use of these treatments.

These drugs target specific underlying factors contributing to male infertility and can be effective in improving fertility outcomes when used appropriately under medical supervision.

Surgical treatment

for male infertility involves procedures aimed at correcting anatomical abnormalities or obstructions that contribute to infertility. These procedures include:

1. Transurethral Resection of Ejaculatory Ducts: This procedure is used to treat ejaculatory duct obstruction. It involves resecting the part of the prostatic urethra where the ejaculatory duct enters, allowing for the unobstructed flow of semen.

2. Vasoepididymostomy: This microsurgery is performed to treat epididymal obstruction. It has been shown to help patients achieve spontaneous pregnancy in 20%-40% of cases without the need for additional assisted reproductive techniques.

3. Vasectomy Reversal Techniques: These techniques are employed in men who have undergone a previous vasectomy. They include vasovasostomy (reconnection of the vas deferens), re-anastomosis of the

testicular and prostatic ends of the vas, and vasoepididymostomy (connecting the vas deferens to the epididymis).

4. Treatment of Testicular Torsion: If the affected testis is viable, orchiopexy (fixation of the testis in the scrotum) is performed. If the testis is necrotic, orchiectomy (removal of the testis) may be necessary. Orchiopexy of the contralateral testis is typically performed regardless of the viability of the affected testis.

5. Varicocele Repair: Various surgical techniques, such as microsurgical varicocelectomy and laparoscopic varicocelectomy, can be used to repair varicoceles (enlarged veins in the scrotum). Microsurgical varicocelectomy is considered the most effective and least invasive technique.

In cases of testicular trauma, early surgical intervention is recommended to reduce complications and preserve fertility. Surgical repair should be performed promptly after trauma to minimize damage and improve outcomes.

These surgical interventions aim to correct structural abnormalities or obstructions, restore normal reproductive function, and improve fertility outcomes in men with infertility issues.

Patient and Method:- The study was conducted from 17 October 2023 to 8 January 2024 in albatool teaching hospital. Inclusion criteria were patients with typical infertility according to their seminal analysis.

Sampling:-

samples of 100 patients were divided into five groups and compared with samples of the control group.

First group:- frequency and percentage of age groups of infertility patients

Second group:- frequency and percentage of infertility types of patients

Third group:- Relation of age groups with infertility types of patients

Fourth group:- Comparative of seminal fluid analysis parameters between patients versus controls

Fifth group:-Relation of seminal fluid analysis parameters with infertility types of patients

Statistical analysis:

Numeric markers were described like Mean±SD. *Student t test* had to reveal the statistics differences between patients compared to controls . Personal and clinical characters expressed as frequencies and percentages, and differences within these percentages were tested by *Pearson-Chi-square test*. $P \leq 0.05$ was based to measure significant differences. Data of our research were programmed by statistical softwares programs (SPSS v. 24.0 and Graph pad prism v. 10)

Results:-

Results of the present study showed the age groups 21-30 and 31-40 years scored the highest percentage 47.0% and 35.0% than 51-60 and >60 years that scored the lowest percentage 4.0%and 2.0% with significant differences ($p<0.05$) (table 1).

Table 1/ frequency and percentage of age groups of infertility patients

	Count	Percent

	21-30	47	47.0%
Age groups (years)			
	31-40	35	35.0%
	41-50	12	12.0%
	51-60	4	4.0%
	>60	2	2.0%

p<0.01**

P>0.05 (no significant) **p<0.05 (significant different)**

Results of the present study showed the patients with primary infertility scored the highest percentage (71.0%) than secondary (29.0%) with significant difference ($p<0.05$) (table 2).

Table 2/ frequency and percentage of infertility types of patients

		Count	Percent
Infertility types	Primary	71	71.0%
	Secondary	29	29.0%

p<0.001***

P>0.05 (no significant) **p<0.05 (significant different)**

Based on association between age groups and infertility types, our findings showed the primary infertility showed highest percentage at age groups ; 21-30 (87.2%), 51-60 (75.0%) and 41-50 (66.7%), compared to secondary infertility that showed highest percentage at age group; >60 (50.0%) and 31-40 (48.6%) . the differences between age groups and infertility was significant ($p<0.05$) (table 3).

Table 3/ Relation of age groups with infertility types of patients

			infertility types		Total	p value
			primary	secondary		
Age groups(years)	21-30	n	41	6	47	p<0.01**
		%	87.2%	12.8%	100.0%	
	31-40	n	18	17	35	
		%	51.4%	48.6%	100.0%	
	41-50	n	8	4	12	
		%	66.7%	33.3%	100.0%	
	51-60	n	3	1	4	
		%	75.0%	25.0%	100.0%	
	>60	n	1	1	2	
		%	50.0%	50.0%	100.0%	
Total		n	71	29	100	
		%	71.0%	29.0%	100.0%	
	P>0.05 (no significant)		p<0.05 (significant different)			

Findings of the conducted study showed decreased levels of total sperm count and total motility in patients (30.21±11.39 and 40.29±9.86) than controls (45.91±8.97 and 62.36±12.08). In contrast, the levels of immotile sperm and pus cells were increased in patients (59.79±8.94 and 15.85±6.33) than controls (37.81±10.05 and 4.21±2.01). The differences between total sperm count , total motility, immotile sperm and pus cells were significant ($p<0.05$).

Finally, the differences between normal morphology, abnormal morphology and RBCs were not significant (p>0.05) (table 4).

Table 4; Comparative of seminal fluid analysis parameters between patients versus controls

Seminal fluid analysis	groups	N	Mean	SD	P value
total sperm count Mill/ml	patients	100	30.21	11.39	*p<0.01***
	controls	50	45.91	8.97	
Total motility %	patients	100	40.29	9.86	*p<0.01***
	controls	50	62.36	12.08	
immotile sperm %	patients	100	59.79	8.94	*p<0.05**
	controls	50	37.81	10.05	
normal morphology %	patients	100	60.12	15.27	*p>0.05*
	controls	50	65.92	21.93	
abnormal morphology %	patients	100	40.88	12.62	*p>0.05*
	controls	50	34.08	13.91	
pus cells	patients	100	15.85	6.33	*p<0.01***
	controls	50	4.21	2.01	
RBCs	patients	100	6.22	2.91	*p>0.05*
	controls	50	4.04	1.89	

P>0.05 (no significant) **p<0.05 (significant different)**

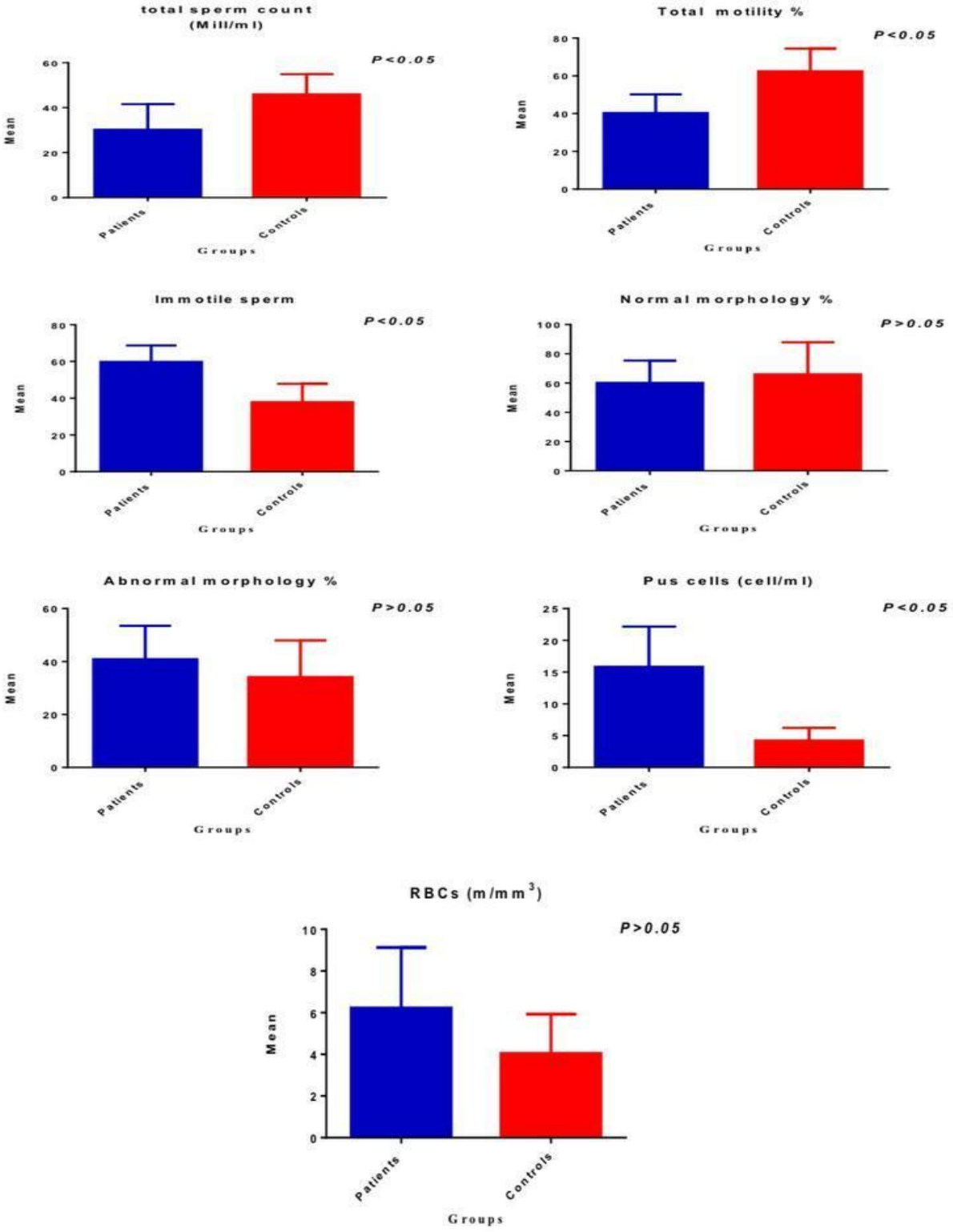

Figure 1; Comparative of seminal fluid analysis parameters between patients versus controls

Table 5/ Relation of seminal fluid analysis parameters with infertility types of patients

	infertility types	N	Mean	SD	P value
Total sperm count	primary	71	32.55	11.39	p>0.05
	secondary	29	28.51	8.97	
Total motility %	primary	71	39.87	9.86	p>0.05
	secondary	29	41.73	12.08	
Immotile sperm %	primary	71	58.43	8.94	p>0.05
	secondary	29	60.08	10.05	
Normal morphology %	primary	71	57.42	15.27	p>0.05
	secondary	29	63.21	21.93	
Abnormal morphology %	primary	71	42.76	12.62	p>0.05
	secondary	29	39.67	13.91	
Pus cells	primary	71	16.55	6.33	p>0.05
	secondary	29	14.42	2.01	
RBCs	primary	71	7.87	2.91	p>0.05
	secondary	29	5.43	1.89	
	P>0.05 (no significant)		p<0.05 (significant different)		

Discussion :-

Research on male infertility is a critical area of study due to its significant impact on couples worldwide. This discussion encompasses various aspects, including: Etiology and Causes: Understanding the underlying causes of male infertility is fundamental to developing effective treatment strategies. Research has identified both genetic and non-genetic factors contributing to male infertility, such as genetic mutations, hormonal imbalances, environmental toxins, lifestyle factors, and medical conditions like diabetes and infections. Diagnostic Tools: Advances in diagnostic techniques, such as semen analysis, hormonal testing, genetic testing, and imaging modalities, have improved the accuracy of identifying male infertility issues. Ongoing research aims to refine these tools and develop novel biomarkers for early detection and personalized treatment approaches.

Treatment Options: Research explores various treatment modalities for male infertility, including medical interventions, surgical procedures, lifestyle modifications, and assisted reproductive technologies (ART) like in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI). Additionally, investigations into alternative therapies, such as stem cell therapy and gene editing techniques, hold promise for future treatment advancements.

Psychosocial Impact: Male infertility can have profound psychological and emotional effects on individuals and couples. Research in this area focuses on understanding the psychosocial impact of infertility, developing supportive interventions, and addressing the stigma associated with male infertility.

Reproductive Health Education: Promoting reproductive health awareness and education is essential to prevent infertility and encourage proactive measures among men. Research efforts aim to disseminate accurate information, debunk myths surrounding male infertility, and encourage early intervention and fertility preservation options.

Ethical Considerations: Research in male infertility raises ethical considerations, particularly concerning assisted reproductive technologies, genetic testing, and the use of donor sperm. Ethical guidelines and regulations play a crucial role in ensuring equitable access to fertility treatments and protecting the rights and well-being of individuals involved

Environmental and Lifestyle Factors: Research explores the impact of environmental pollutants, lifestyle factors (such as smoking, obesity, and excessive alcohol consumption), and occupational hazards on male fertility. Identifying and mitigating these factors through public health interventions and lifestyle modifications can contribute to improving male reproductive health.

Epigenetics and Sperm Quality: Epigenetic modifications in sperm cells have been linked to male infertility. Investigating epigenetic changes and their effects on sperm quality and fertility outcomes provides insights into potential targets for therapeutic interventions and personalized treatment approaches.

Male Contraception: Developing safe and effective male contraceptive methods is an active area of research. Investigational approaches include hormonal contraceptives, non-hormonal methods targeting sperm production or function, and novel delivery systems. Advancements in male contraception offer men

more control over family planning and contribute to gender equity in reproductive health.

Fertility Preservation: Research into fertility preservation techniques for men facing infertility due to medical treatments (such as chemotherapy or radiation therapy) or other factors is crucial. Cryopreservation of sperm, testicular tissue, or stem cells offers options for preserving fertility potential and future reproductive options.

Global Perspectives and Access to Care: Disparities in access to infertility diagnosis and treatment exist globally, with socioeconomic, cultural, and geographical factors influencing access to care. Research aims to address these disparities by identifying barriers to care, developing affordable and culturally sensitive interventions, and advocating for equitable access to fertility services worldwide.

Long-term Health Outcomes: Male infertility may be associated with an increased risk of other health conditions, such as cardiovascular disease, metabolic disorders, and certain cancers. Longitudinal studies investigating the relationship between male infertility and long-term health outcomes provide valuable insights into the broader implications of reproductive health on overall well-being.

Male Age and Fertility: Research increasingly recognizes the impact of male age on fertility and reproductive outcomes. Advanced paternal age has been associated with decreased sperm quality, increased DNA fragmentation, and higher risk of genetic abnormalities in offspring. Understanding the effects of

male age on fertility can inform reproductive counseling and family planning decisions.

Role of Microbiome: Emerging research suggests that the male reproductive tract has its own microbiome, which may influence sperm quality and fertility. Investigating the composition and function of the male reproductive microbiome offers insights into potential links between microbiota dysbiosis and male infertility, paving the way for novel diagnostic and therapeutic strategies.

Nutritional and Dietary Factors: Studies explore the impact of nutrition and dietary factors on male fertility. Certain micronutrients, antioxidants, and dietary patterns have been associated with improved sperm parameters and fertility outcomes. Research in this area aims to identify dietary interventions that support male reproductive health and optimize fertility.

Social and Cultural Perspectives: Understanding the social and cultural dimensions of male infertility is essential for providing culturally competent care and support. Research examines how cultural beliefs, gender norms, stigma, and socioeconomic factors influence perceptions of masculinity, help-seeking behaviors, and access to infertility services among men and couples from diverse backgrounds.

In summary, ongoing research efforts in male infertility encompass a wide range of areas, including etiology, diagnostics, treatment options, psychosocial impact, environmental factors, epigenetics, contraception, fertility preservation, global health, and long-term health outcomes. Collaborative and interdisciplinary approaches are essential to address the multifaceted challenges

and complexities of male infertility and to improve outcomes for individuals and couples affected by this condition.

Conclusion:-

In conclusion, research into male infertility continues to uncover various factors contributing to the condition, ranging from genetic and non-genetic influences to environmental and lifestyle factors. While advancements have been made in understanding the complexities of male infertility, a significant portion of cases still remain unexplained. Continued research efforts are crucial to further unravel the underlying mechanisms, improve diagnostic tools, and develop effective treatment strategies to help couples facing infertility achieve their reproductive goals. Additionally, raising awareness about male infertility and promoting proactive measures to maintain reproductive health are essential steps in addressing this widespread issue.