Original Article

Role of Fine Needle Aspiration Cytology (FNAC) for Assessing Spermatogenesis in Patients with Azoospermia

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Mohammed Mustafizur Rahman[1*], Shabnam Imam[2], A K M Maruf Raza[3], Asma Ul Hosna[4], Sayedatun Nessa[5]

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*Corresponding Author

ABSTRACT

Introduction: *Recent advances of In vitro Fertilization (IVF) and Intracytoplasmic Sperm Injection (ICSI) combined with the progress in sperm retrieval from testis have provided a hope for azoospermic patients to become fathers.* ***Objective:*** *The aim of this study was to describe the cytological features of the cells aspirated from testes of patients with azoospermia and to select those who have mature spermatozoa in their aspirate for assisted fertilization.* ***Methods & Materials:*** *This was a prospective cross-sectional observational study conducted in Popular Diagnostic Center, Dhanmondi, Dhaka during May 2020 to September 2023. Under local anesthesia Fine Needle Aspiration Cytology (FNAC) was performed on 293 patients whose sperm count was zero in at least three consecutive semen samples. The collected data were analyzed using Statistical Package for Social Sciences (SPSS), version-23.0. The size of the testes was measured and recorded for each case. The cytological features of the aspirated cells were described and the patients who have mature spermatozoa were identified for assisted fertilization.*

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1. *Associate professor, department of Pathology, Popular Medical College, Dhanmondi, Dhaka, Bangladesh*
2. *Associate professor, department of Community Medicine, Bangladesh Medical College, Dhanmondi, Dhaka, Bangladesh*
3. *Professor, department of Pathology, Jahurul Islam Medical College, Bajitpur, Kishoregong, Bangladesh*
4. *Associate professor, department of Pathology, Bashundhara Ad- din Medical College, Dhaka, Bangladesh.*
5. *Associate professor, department of Pathology, Northern International Medical College, Dhaka,* Bangladesh

Results: *A total of 293 patients with confirmed azoospermia aged above 18 years and male gender were enrolled in this study. The most frequent age group of the patients was (46-60) years which includes 210(71.67%) of the patients. The mean age of the patients was 38.59±3.39 years. The most frequent risk factors of infertility were observed to be nil significant 219(74.47%). According to FNAC findings, the most frequent cytological type of spermatogenesis was observed to be complete maturation arrest at primary spermatocyte in 115(39.24%) patients of azoospermia followed normal spermatogenesis in 68(23.20%) patients, complete maturation arrest at secondary spermatocyte in 46(15.69%) patients and atrophic testis in 29(9.89%) patients.* ***Conclusion:*** *This study investigated that FNAC helps to easily and accurately identify all types of testicular cells without biopsy. SI, SEI, and SSI are powerful cell indices for assessing the extent of spermatogenesis and classifying various causes of azoospermia.*

Key words: *Role, fine needle aspiration, assess, spermatogenesis, azoospermia*

INTRODUCTION

Fine needle aspiration of the testis as an alternative to open biopsy has been used to characterize the state of infertility for the last 40 years. It is well recognized as a reliable and informative technique in assessment of spermatogenesis and semen analysis is the most accepted initial investigation for evaluation of testicular function in the assessment of male infertility [1]. The absence of sperm cells in the semen after evaluation on at least two occasions is known as azoospermia. The etiology of azoospermia may be attributed to pre-testicular causes, testicular causes and post testicular causes[2]. Azoospermia is present in 10%-15% of men evaluated for infertility until recently testicular biopsy was the standard method for ascertaining the etiology of azoospermia[3]. However, it requires a surgical procedure that is usually performed under general anesthesia. Fine needle aspiration cytology (FNAC) has gained increasing popularity as a simple, minimally invasive and rapid technique that can be performed on an outpatient basis and also that can help in assessing testicular function accurately as an alternative. Aspiration of testis was advocated in the initial decades of 19th century[4]. Male infertility is a common issue that can be devastating to a couple trying to conceive. According to research, infertility is a problem for 15% of potential couples. Biopsy of the testis helps in differentiating an obstructive etiology of male infertility[5] from an intrinsic testicular cause. When post- testicular azoospermia or severe oligospermia is demonstrated, surgical correction may be indicated[6]. Fine needle aspiration cytology (FNAC) of the testis is used as a minimally invasive method. Assessing the role of a forthcoming alternative to open testicular biopsy involves fine needle aspiration cytology. Specimens for cytological analysis of interstitial cells and spermatogenesis are obtained using the FNAC technique[7]. However, there are very few studies and limited data regarding the role of FNAC to assess spermatogenesis in the patients with azoospermia in Bangladesh. The aim of this paper was to assess the role of FNAC for assessing spermatogenesis in patients with azoospermia.

METHODS & MATERIALS

This was a prospective cross-sectional observational study conducted in Popular Diagnostic Center, Dhanmondi, Dhaka during May 2020 to September 2023. The study protocol was developed and approved and written informed consent was obtained and a total of 293 patients with confirmed azoospermia aged above 18 years and male gender were enrolled in this study. The age of the patients and the greatest dimension of the testis were recorded in a case record form (CRF). Fine Needle Aspiration Cytology (FNAC) from both testis are performed under local anesthesia using disposable syringe and fine needle (gauge 23 G). A smear of the aspirated material is prepared, fixed in 95% ethanol and stained by Papanicolaou stain. The collected data were analyzed using Statistical Package for Social Sciences (SPSS), version-23.0. Descriptive inferential statistical analysis were performed and the results were presented in frequency and percentage in tables and charts. The cytological features of the aspirated cells were described and the patients who have mature spermatozoa were identified for assisted fertilization. The inclusion and exclusion criteria of this study were as follows:

Inclusion Criteria:

- Age: Above18 years
- Confirmed azoospermia patients
- Willing to participate in the study

Exclusion Criteria:

- Age: Below 18 years
- Unconfirmed azoospermia patients
- Unwilling to participate in the study

RESULTS

Table I shows the distribution of baseline characteristics of the study patients. Among the patients, the most frequent age group was (46-60) years which includes 210(71.67%) followed by 65(22.18%),(31-45) years, 18(6.14%),(<30) years. The mean age of the patients was 38.59±3.39 years. The most frequent socio-economic condition of the patients was upper class 211(72.01%) followed by middle class 67(22.86%), lower class 15(5.11%). The majority of the patients were from urban area 287(97.95%).

Table I: Distribution of baseline characteristics of the study patients (*n*=293).

Age(years)	Frequency	Percent
<30	18	6.14
31-45	65	22.18
46-60	210	71.67
Mean age(years)	38.59±3.39	
Socio-economic condition		
Upper class	211	72.01
Middle class	67	22.86
Lower class	15	5.11
Total	293	100
Residence		
Urban	287	97.95
Rural	6	2.04
Total	293	100

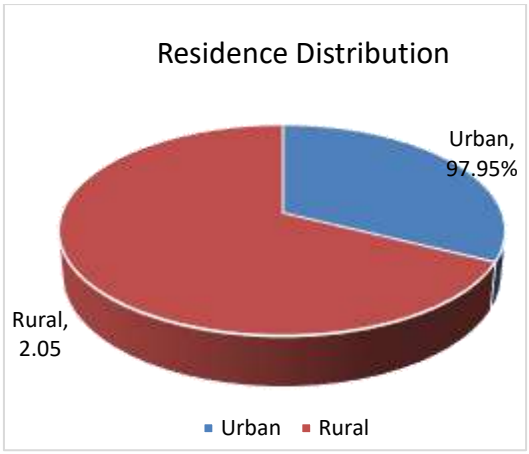

Figure 1: shows the residence distribution of the study patients (*n*=2930).

Figure 1 shows the residence distribution of the study patients. 2.05 ware in Rural and 97.95 ware Urban.

Table II shows the distribution of risk factors of infertility. The most frequent risk factors of infertility was observed to be nil significant 219(74.47%) followed by mumps orchitis 44(15.01%), inguinal/ scrotal surgery 30(10.23%).

Table II: Distribution of risk factors for infertility (*n*=293).

Risk factors	Frequency	Percent
Nil significant	219	74.47
Mumps orchitis	44	15.01
Inguinal/ scrotal surgery	30	10.23
Total	293	100

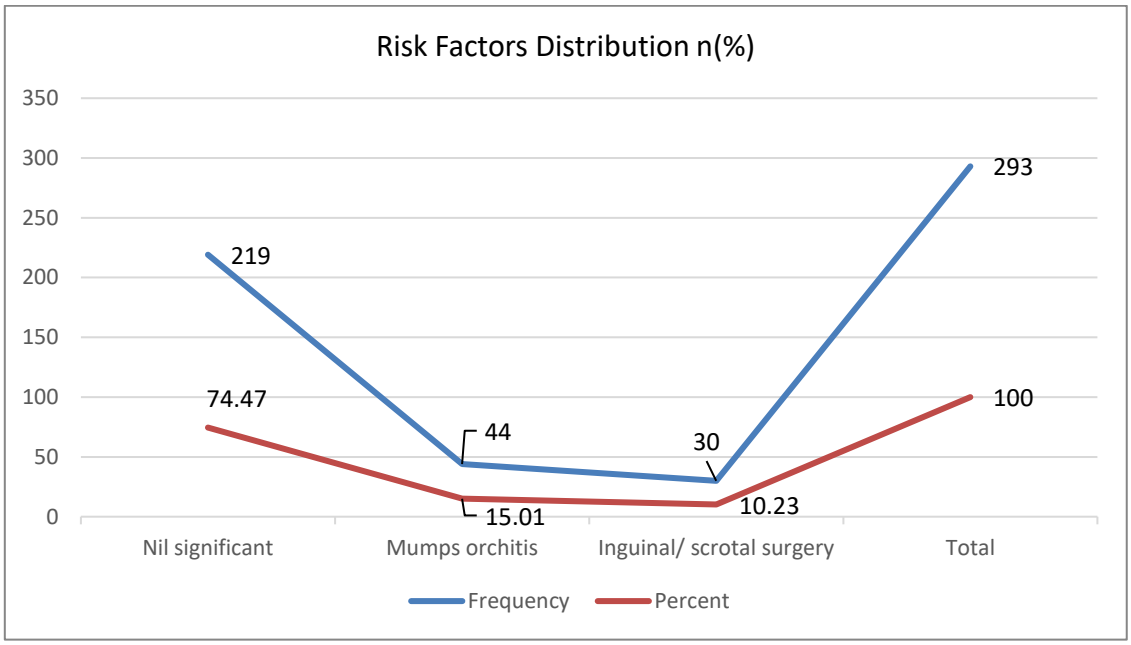

Figure 2: shows the risk factors distribution of infertility (*n*=2930).

Figure 2 shows the risk factors distribution of infertility. Nill significant ware 74.47%, Mumps orchitis ware 15.01% and Inguinal/scrotal surgery ware 10.23%.

Table III shows the frequency distribution of testicular size and varicocele. The most frequent testicular size was observed to be normal size testes in 235(80.20%) patients followed by unilateral varicocele 45(15.35%) and bilateral varicocele 27(9.21%).

Table III: Frequency distribution of testicular size and varicocele (*n*=293).

Physical Examination	Frequency	Percent
Normal sized testes	235	80.20
Unilateral varicocele	45	15.35
Bilateral varicocele	27	9.21
Total	293	100

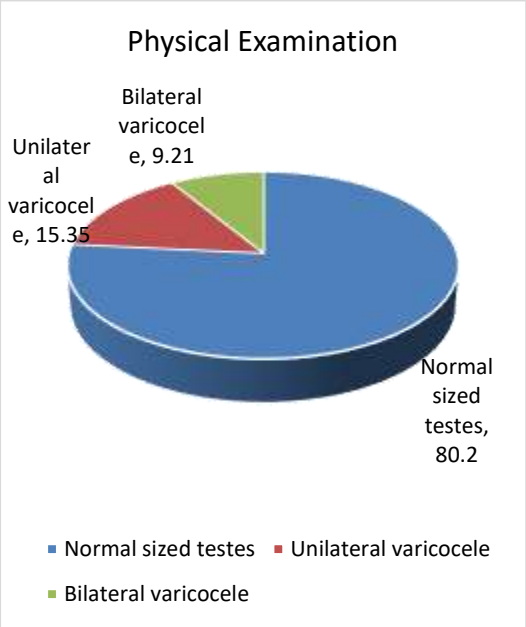

Figure 3: shows the distribution of physical examination of the study patients (*n*=293)

Figure 3 shows the distribution of physical examination of the study patients. 80.2% ware normal sized testes, 15.35 ware unilateral varicocele and 9.21 ware bilateral varicocele.

Table IV shows the distributions of FNAC findings in study patients. According to FNAC findings, the most frequent cytological type of spermatogenesis was observed to be complete maturation arrest at primary spermatocyte in 115(39.24%) patients of azoospermia followed normal spermatogenesis in 68(23.20%) patients, complete maturation arrest at secondary spermatocyte in 46(15.69%) patients and atrophic testis in 29(9.89%) patients.

Table IV: Distributions of FNAC findings in study patients (*n*=293).

FNAC- Cytological Type	*n*	%
Normal spermatogenesis	68	23.20
Complete maturation arrest at primary spermatocyte	115	39.24
Complete maturation arrest at secondary spermatocyte	46	15.69
Germ cell aplasia (Sertoli cell only syndrome)	35	11.94
Atrophic testis	29	9.89
Total	293	100

DISCUSSION

In this present study a total of 293 confirmed patients with azoospermia were enrolled to assess the role of FNAC to assess the spermatogenesis. This present study observed the most frequent age group of the patients with azoospermia was (46-60) years which includes

210(71.67%) of the patients. The mean age of the patients was observed to be 38.59±3.39 years. The most frequent socio-economic condition was upper class 211(72.01%) The majority of the patients were from urban area 287(97.95%). Almost the similar observation was found in another study conducted by Jashnani Ket al, (2020). They observed the mean age of the patients to be 32.75 years (n=40)[7]. In our study, we observed that the most frequent testicular size was normal size testes in 235(80.20%) patients. In this present study we finally observed that the most frequent cytological type of spermatogenesis was complete maturation arrest at primary spermatocyte in 115(39.24%) patients of azoospermia, 68(23.20%) patients had normal spermatogenesis, 46(15.68%) patients had complete maturation arrest at secondary spermatocyte and 29(9.89%) patients had atrophic testis. Another study conducted by Kumar R et al, (2006)[8]. They observed of the 10 men who satisfied the inclusion criteria, 6 had hypospermatogenesis and in 4 FNAC showed maturation arrest. On surgical exploration, none had sperm in the epididymis. The assessment of cytological type of spermatogenesis in these present studies are comparable with another study. The morphological diagnosis revealed normal spermatogenesis in 12 patients (17.9%), hyposparmatogenesis in 4 (5.9%), spermatogenic arrest in 39 (58.2%), sertoli cell only in 7 (10.4%), and complete tubular hyalinization in 5 patients (7.4%). We can further compare the results of this study with another study conducted by the commonest group with infertility were in the age group 21-30 years. On semen analysis 78% were azoospermic and 22% were oligozoospermic. The testicular size was normal in 90% of subjects and 10% had small testis. Out of fifty subjects with infertility, 40% subjects had varicocele. Varicocele was commonly associated with duct obstruction. The commonest patterns observed on cytology were; normal spermatogenesis (14/50, 28%), duct obstruction (8/50, 16%), maturation arrest (7/50, 14%) and testicular atrophy (7/50, 14%) [9,10]. In the present study diagnostic accuracy was 93.4. From the findings of this present study and comparing with some other studies we can conclude that he role of FNAC is an effective procedure to determine the role spermatogenesis in Patients with Azoospermia. This procedure is very cost effective and an easy procedure compare to biopsy. The findings of this present study are also partially persistent with some other studies[11-15].

Conclusion:

This study investigated that FNAC helps to easily and accurately identify all types of testicular cells without biopsy. Sperm index (SI), sertoli index (SEI), and sperm-sertoli index (SSI) are powerful cell indices for assessing the extent of spermatogenesis and classifying various causes of azoospermia. FNAC can thus play a very significant role in the evaluation of male infertility.

Limitations of the study:

This was a single center study conducted with a purposive sampling technique over a short period of time. Therefore the results of this study may not reflect the whole country.

Recommendations:

A multicenter study is recommended with an adequate sample size over a long period of time on national scale is recommended.

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