Clin Schizophr Relat Psychoses
Volume 15: S6, 2021
Doi: 10.3371/CSRP.AA.280721

Clinical Schizophrenia & Related Psychoses

Research Article

Hybrid Open Access

Preoperative Measures of Serum Inhibin B, and FSH Levels Predict Sperms Retrieval Outcome in Non-Obstructive Azoospermic Males

Adnan AH Al-Bdairi[1], Hayder Abdul-Amir Makki Al-Hindy[2*], and Mohend AN Al-Shalah[3]

[1]*Department of Gynaecology, University of Babylon, Hillah, Iraq*

[2]*Department of Pharmacology and Toxicology, University of Babylon, Hillah, Iraq*

[3]*Department of Surgery, University of Babylon, Hillah, Iraq*

Abstract

Background: Azoospermia has defined as totally absent sperms from ejaculate after two separate semen analyses that roughly could ensue in 10%-15% of infertile males with the atypical seminal examination. The main two sub classification of infertility are "Obstructive (OA) and Non-Obstructive (NOA). The sperm retrieval of testicles by "Fine-Needle Aspiration (FNA) or Testicular Sperm Extraction (TESE)" can give a promising result of reproduction. Currently, the use of diagnostic tests like a Follicular Stimulating Hormone (FSH) besides Inhibin-B for the valuation of spermio genesis by several trials has widely spread. This study aimed to investigate the association of serum Inhibin B and FSH with testicular biopsy and to reduce avoidable analytic testicular biopsies in males with NOA.

Methodology: The study was a case-control observational, included 100 infertile males and 100 control males, attending Teba Fertility Private Center, Babylon, Iraq. All participants underwent full history, physical examination, hormonal assays for Testosterone, FSH, LH, Prolactin, Inhibin-B, and seminal analysis. Those who justify the study standards were chosen and undergone two-sided Testicular Sperm Extraction (TESE). Statistical scrutiny carried out by SPSS/V-25. Categorical parameters had presented as frequency and percentage. Continuous parameters had present as (Means ± SD). Student test had applied to match means between any 2-groups. Mann-Whitney test had applied to match means between 2-groups in case variable was not normally distributed. Pearson's correlation coefficient (r) had used to find the relationship between two continuous variables. The ''Research Operating Characteristics (ROC) curve'' analyses had done to predict sensitivity and specificity of Inhibin B and FSH for positive TESE results. ''Pearson chi-square'' had applied to show the link between categorical parameters. Any P ≤ 0.05 value was selected as significant.

Results: Significant difference were shown in the means of years of infertility, besides significant variations between the serum inhibin means between the two study groups (P<0.001). There were significant differences between means of inhibin B (pg/ml) according to (positive and negative) TESE results among the Azoospermia group (P=0.003). The differences Inhibin B, FSH, LH, prolactin, and testosterone according to TESE results revealed significant differences between medians of Inhibin Band FSH(0.003 and 0.007), respectively. The ROC curve for sensitivity and specificity of Inhibin Bto predict positive TESE and FSH to predict positive TESE results, which revealed P-value, optimal cut off value to predict positive TESE test, sensitivity, and specificity were [0.001, ≥ 22.65pg/ml, 74.1%, and 65.1%] and [0.007, ≥ 13.95, 74.4%, and 59.3%], sequentially. A significant negative (r= -0.482 and P-0.001) correlation between Inhibin B and FSH among the studied participants was observed.

Conclusion: Higher sperm retrieval from TESE was significantly correlated with higher levels of Inhibin B and lower FSH in the serum among the NOA patients. Preoperative Inhibin B and FSH can apply for prediction and counseling. Inhibin B>22.65 pg/ml predicts positive, and FSH ≥ 13.95 mIU/ml predicts negative TESE with a sensitivity and specificity of (74.1%, 65.1) and (74.1%, 65.1), respectively. Hence, could be a real, non-invasive, accessible, and economic model for assessing NOA males to predict the outcome of sperm retrieval.

Keywords: Infertility • Sperm retrieval • Follicular stimulating hormone • Correlation

Introduction

As a common medical problem, infertility is distressingnearly 15%-20% of couples attempting gestation. Factors affecting males may account for about 40%-50% of the total infertile couples. Hence, the management of etiologies of male infertility like azoospermiais of particular importance[1,2]. Azoospermia has defined as totally absent sperms from ejaculate after two separate semen analyses that roughly could ensue in 10%-15% of infertile males with atypical seminal examination[3,4].The main two sub classifications of infertility are " Obstructive (OA) and Non-Obstructive (NOA)" [5,6]. Specific investigations and testicular biopsy have been recommending to distinguish an OA from NOA. A probable sequel of this invasive procedure included; testicular hematoma, infection, devascularization, and fibrosis could harmfully affect the function of the testicles [7-9].

The sperm retrieval of testicles by" Fine-Needle Aspiration (FNA) or Testicular Sperm Extraction (TESE)" can give a promising result of reproduction. However, the success rate of positive sperm recovery may not exceed 50% of casesn [6,8,9]. Consequently, non-invasive laboratory tests that can predict the spermatic presence in males with OA would be of great significance. Currently, the use of diagnostic tests like a (FSH) and Inhibin-B for the valuation of spermio genesis in several trials has increased. On the other hand, most of the dependable urologic guidelines did not rely on the initial Inhibin-B assay alone, owing to the erratic results that had been achieved [10,11].Inhibin B is one of the ''transforming growth factor super family''[12]; that include TGF-βs, activins, and bone morphogenetic

***Corresponding Author:** *Hayder Abdul-Amir Makki Al-Hindy Department of Pharmacology and Toxicology, University of Babylon, Hillah, Iraq;*

Email: phar.hayder.abdul@uobabylon.edu.iq

Received date: 12 July, 2021; **Accepted date:** 26 July, 2021; **Published date:** 02 August, 2021

proteins [12-15]. Inhibin-B is a known hormonal product of ''Sertoli cells''and decreases FSH release by gonadotropic cells [16]. Inhibin- Bglyco protein has been suggesting as a biomarker of Sertoli cells' function and indirect indicator of spermio genesis [8].

FSH is a hormone released from adenohypophysis that promotes spermio genesis by stimulating Sertoli cells. Its release is regulated by the hypothalamic-hypophysial-testicular axis [17].

In line with many arguments of various surveys, the aim of the study was to investigate the association of blood Inhibin-B and FSH with testicular biopsy and to reduce avoidable analytic biopsies of testicles in NOA males.

Materials and Methods

The study was a case-control observational, completed from January to April-2021 included 100 infertile males and 100 control subjects. Both groups presented with the initial finding of infertility referred to the ''Teba Center'', Babylon-Iraq. The control group had recruited from those attending the center. All participants underwent complete history, physical examination, hormonal assays for Testosterone, FSH, LH, Prolactin, Inhibin-B, and seminal analysis. Those who fit the study standards were chosen and submitted for bilateral testicular sperm extraction (TESE). The clinical examination had completed for all the participants for the structural reliability of the urogenital organs. The conclusion of NOA had based on clinical findings and factors like FSH, testosterone, testicular volume besides past histopathology of the testicles (if existed). However, there was no standard manner had been used

Hormonal assays

Hormonal assays of four hormones including FSH, LH, prolactin, and testosterone together had been analyzed by" Immuno Enzymometric Assay from TOSOH® USA". Blood Inhibin-B concentrations have been estimated followed by sperm retrieval using “paramagnetic particle Chemi Luminescent Immune Assay (CLIA)” iFlash-Inhibin B, manufactured by YHLO®.

Seminal analyses

Seminal fluid analyses had achieved using "Computer Assisted Semen Analysis" (CASA) according to the world WHO standards[2].

Testicular sperm extraction

Sperms retrieval had done at multiple testicular sites. The open biopsy was performed either in the supplier's office, or a private hospital. The scrotal skin had sterilized with a suitable antiseptic agent. The surrounded areas had protected with a sterilized cloth. After local anesthesia, atrivial incision had done over the skin. Then, removing of a tiny piece of the testicular tissue is followed by stitching of the testicular opening and the incised skin. The same technique is reiterated for the other testis if needed.

Statistical analyses

Statistical scrutiny carried out by SPSS/V-25. Categorical parameters had presented as frequency and percentage. Continuous parameters had present as (Means ± SD). Student test had applied to match means between any 2-groups. Mann-Whitney test had applied to match means between 2-groups in case variable was not normally distributed. Pearson’s correlation coefficient (r) had used to find the relationship between two continuous variables. Pearson chi-square and Fisher-exact test” were performed to study the relation between categorical parameters. Any $P \leq 0.05$ was selected as significant.

Results

Figure 1 displays the percentages of patients in relation to TESE results among study groups (azoospermia and normal seminal analyses). Azoospermia represents (N=70, 43.8%) of study patients.

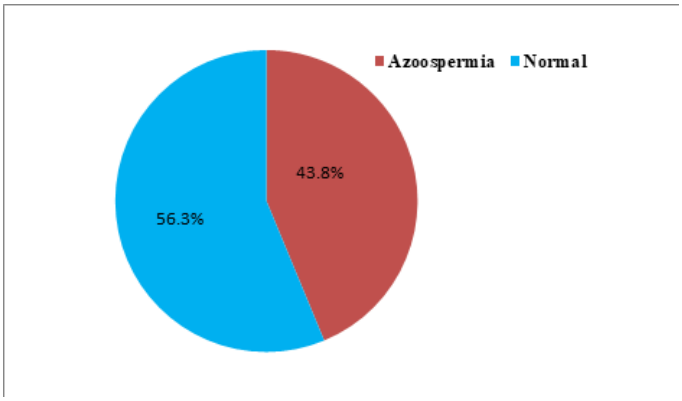

Figure 1. Distribution of patients according to results of TESE.

Table 1 The mean differences of age and years of infertility according to study groups (Azoospermia and normal seminal analysis).There were significant variations between mean years of infertility between the study groups.

Study variables	Groups	N	Mean	SD	P-value
Age (years)	Azoospermia	70	34.56	7.93	0.083
	Normal	90	32.57	5.96	
Duration of infertility (years)	Azoospermia	70	7.09	4.94	0.008
	Normal	90	5.17	4.07	

Table 1. The mean differences of age and years of infertility between study group.

Figure 2 The differences in the mean Inhibin B levels (pg/ml) between the study groups (Azoospermia and normal seminal analyses). There were significant differences between means of inhibin according to the study group (P<0.001).

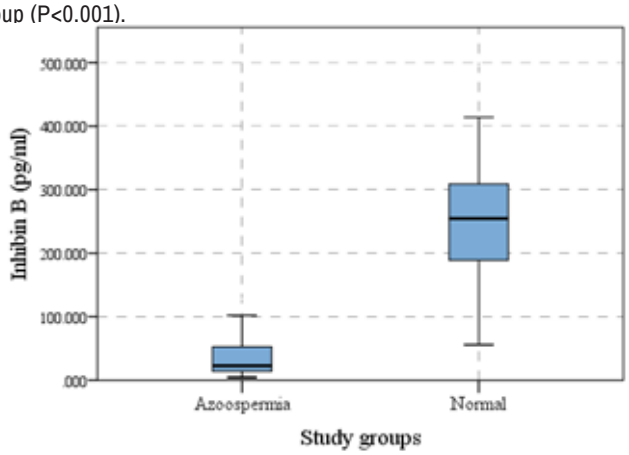

Figure 2. Box plot differences of the inhibin (pg/ml) means between the study group (N=160).

There were significant differences between means of inhibin B(pg/ml) according to (positive and negative) TESE results among the Azoospermia group (P=0.003).The differences Inhibin B, FSH, LH, prolactin, and testosterone according to TESE results revealed significant differences between medians of Inhibin B, FSH, and LH (0.003, 0.007, and 0.003), respectively (Table 2).

Variables	TESE Results	N	Mean	Median	P-value
IB (pg/ml)	Positive	27	54.73	42.91	0.003*
	Negative	43	25.9	22.45	
FSH (mIU/ml)	Positive	27	21	11.6	0.007*
	Negative	43	23.9	21.2	
LH (mIU/ml)	Positive	27	7.21	4.3	0.003*
	Negative	43	8.84	7.3	
Prolactin (ng/ml)	Positive	27	9.6	8.7	0.372
	Negative	43	15.43	9.2	
Testosterone (ng/dl)	Positive	27	353.49	311.49	0.713
	Negative	43	356.98	332	
*Significance (P=0.003).					

Table 2. The mean/median differences of Inhibin B, FSH, LH, prolactin, and testosterone according to TESE results (N=70).

Figure 3 shows the ROC curve for sensitivity and specificity of Inhibin B (pg/ml) to predict positive TESE results, (AUC=0.738), (P=0.001) 95% CI (0.614-0.862) and the optimal cut off value to predict positive TESE test was ≥ 22.65, (sensitivity=74.1%, specificity=65.1% and overall accuracy =68.57%).

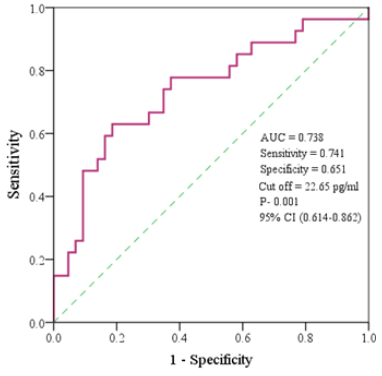

Figure 3. ROC-curve of inhibin B to predict positive from negative TESE.

Figure 4 show the ROC curve for sensitivity and specificity of FSH (mIU/ml) to predict negative TESE results, AUC=0.693, P=0.007,95% CI (0.56-0.827) and the optimal cut off value to predict negative TESE test was ≥13.95, (sensitivity=74.4%, specificity=59.3% and overall accuracy =68.57%).

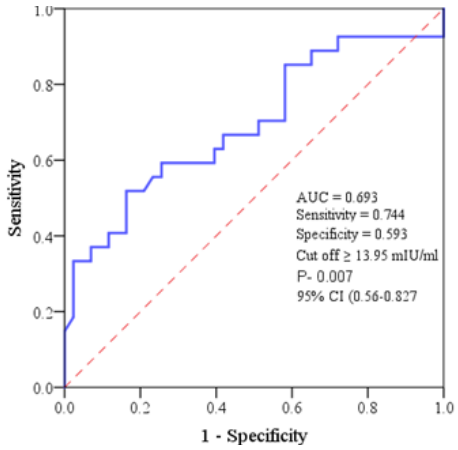

Figure 4. ROC curve for FSH to predict negative from positive TESE.

There was a significant negative correlation (r=-0.482 and P-0.001) between Inhibin B and FSH among the studied participants (Table 3).

	Statistics	IB pg/ml
FSH mIU/ml	Pearson Correlation	-0.482
	Significance	0.001*
*Significace negative correlation (r=-0.482 and P-0.001).		

Table 3. Correlation of serum Inhibin B with FSH among study participants.

Discussion

Deliveries of children conceived with TESE from males with NOA have been described [18]. As a result, the combination of TESE and "intracyto plasmic sperm injection" may provide the NOA males a higher opportunity of fathering their inherent offspring, though they do not expose normal spermatogenesis.

Although TESE is an effective diagnostic and therapeutic option, yet may not continuously be successful in all NOAs [19,20]. Consequently, a failing sperm retrieval practice has vitale motive and economic impacts that underscore the significance of defining the predicting factors for fruitful sperm recovery. This could present genuine prospects for the couple and the clinician together [8,21].

The physiological effect of FSH and Inhibin-B in governing the "hypothalamic-hypophysial-testis axis" is indubitable. Several revisions consider that Inhibin B is worthy and more predictive for spermio genesis than FSH [21-23]. Contrariwise, other researchers had proclaimed that the value of FSH is more[24,25].Instead, other studies have stated that neither FSH nor Inhibin B, separately, could precisely predict the sort of spermio genic injury[5,26]

What we had reached in this study was that Inhibin B is lower in azoospermic males seven times than normal males. Additionally, once Inhibin B is >22.65 pg/ml and FSH is <13.95 mIU/ml, the positive sperm detection will be high with TESE. A significant outcome of this work was the association of positive sperm recovery with plasma Inhibin B. There were significant variations in the measures of Inhibin B between the patients with positive and negative TESE results (P-0.003). In addition, the values of FSH were significantly less in the positively compared to the negatively retrieved groups (P-0.007). These findings are consistent with a recent Syrian study conducted on 228 males with NOA and other previous Italian

studies conducted on 89 patients with NOA [8,27].

Sertoli cells maintain spermatogenesis via several paracrine pathways, including Inhibin B release [8].An increasing body of literature suggests that Inhibin B levels areun measurable in males suffering SCOS, even with ordinary testosterone values; signifying damaged Sertoli cells [28]. Hence, Inhibin B reflect directly Sertoli cell activity and indirectly spermato genesis. It has to be pointed out that the castration causes reduced Inhibin B values, showing that Inhibin B is produced by the testicles. As well, suppressed spermio genesis induced by exogenous androgens or cytotoxic agents is associated with suppressed blood InhibinB concentration [29,30].

Supporting our findings, the outcomes reported by Von [28]. They found that the predictability of InhibinB is slightly more than FSH, but they cannot accurately expect the results of the biopsy. The authors supposed that mixed OA and NOA causes may mutually coincide in infertile males in this study.

To scrutinize whether Inhibin B or FSH is superior to predict sperm recovery; the authors made a comparative examination of these hormones. ROC analyses of Inhibin B validated a sensitivity and a specificity [74.1% and 65.1%] compared to [74.4% and 59.3%], respectively for FSH. As a result, even with the parallel inclusive analytic performance of these 2-hormones still, Inhibin B seems superior for proper detection of azoospermic males with spermiogenic foci. Meanwhile, FSH seems better in the detection of azoospermic males without spermiogenesis. These outcomes are in agreement with recent studies [6,9,31].

The best threshold of Inhibin Bt that distinguishes between succeeded and failed TESE by the ROC curve in this study was 22.65 pg/ml that was parallel to the limited researches on Inhibin B and excellence of spermio genesis up to now[8,30,32]. These results deliver robust evidence that Inhibin B is a significant indicator of competent Sertoli cells and spermio genesis.

The cut-off point for serum FSH in our study was 13.95 mIU/ml, consistent with a current Iranian study [31]. However, the cut-off value for serum FSH is quite inconstant for predicting the successful sperm recovery in azoospermia, and no settlement has been gain in this respect.

Our findings confirm preceding results indicating an inverse relation between Inhibin B and FSH serum values [27, 30, 33], further supporting the idea that Inhibin B contributes to the bio-regulation of FSH secretion in males.

The sperm retrieval significantly fell when FSH elevated Figure 4 are intriguing in the context of preceding revisions reported that FSH predicts the existence of sperms in cases that Inhibin B cannot. Added, Inhibin B, FSH, and testicular volume cannot assume the Positive Predictive Value (PPV) of biopsy [25]. In believed that the combined use of Inhibin B with FSH useful for the expectation of 100% PPV of testicle biopsy. Nevertheless, this combination does not exclude the necessity for a biopsy completely [5,34]. Still, groups of infertile patients were not analogous regarding the dissimilar inclusion criteria. Mutually, the two pieces of research require further external confirmations. Contrarily, other data have verified high retrieval rates in azoospermia with higher FSH values [35].

These conflicts could be related to technical variations for sperm retrieval. Micro TESE has higher sperm recovery testicular biopsy [36]. Further, low successful sperm recovery has been described by FNA compared to TESE [37]. Additionally, the use of two-sided testicular biopsy with a minimum of six biopsy sites has been acclaim to retrieve sperms in azoospermia [31]. The authors proposed another principal cause for the unevenness related to the simultaneous existence of a mixed cause of azoospermia.

The study models will assist to signify NOA who will have a good or poor opportunity for positive retrieval and the couples who will have a higher prospect of attaining a live birth after successful TESE. Additionally, it will allow couples a better assessment of risks versus benefits before initiation of invasive interferences.

Study Limitation

We noted few limitations in our study. Firstly, is the small sample size and computing cut-off limits should be constructed on a larger series Secondly is the lack of comprehensive inherited profiles. Consequently, some definite genetic disorders had not considered. Sooner or later, more surveys with advanced molecular genetic are desirable to find responses to the prevailing argument.

Conclusion

High sperm retrieval from TESE was significantly correlated with high levels of Inhibin B and lower levels of FSH in the serum among the NOA patients. Preoperative Inhibin B and FSH can apply for prediction and counseling. Inhibin B >22.65 pg/ml predicts positive, and FSH ≥ 13.95 mIU/ml predicts negative TESE with a sensitivity and specificity of (74.1%, 65.1) and (74.1%, 65.1), respectively. Hence, could be a real, non-invasive, accessible, and economic model for assessing NOA males to predict the outcome of sperm retrieval. Further future studies are mandated for the generalization of our outcomes.

Ethical Consideration

All Participants passed informed agreement, consistent with the protocol permitted by the Local Institutional Ethics Committee.

References

1. Zhang, Han, Qi Xi Xinyue Zhang, Hongguo Zhang, and Yuting Jiang, et al.“Prediction of Microdissection Testicular Sperm Extraction Outcome in Men with Idiopathic Nonobstruction Azoospermia.”*Medicine* 99 (2020):19934.
2. World Health Organization. Laboratory Manual for the Examination and Processing of Human Semen 5th edtion. Geneva:Cambridge University press, Switzerland (2010).
3. Ezeh, Uchechukwu io.“Beyond the Clinical Classification of Azoospermia: Opinion.”*Hum Reprod* 15 (2000): 2356-2359.
4. Karbel, Hadeel, Khairullah Ahmed R, and Al-Humairi Ameer K.“ Histopathological Evaluation of Non-Obstructive Azoospermic Males Using Testicular Aspirate (TESA) Biopsy. *Ind J For Med Toxic* 14(2020): 2993-3000.
5. Pavan-Jukic, Doroteja, David Stubljar, Tomislav Jukic, and Andrej Starc.“Predictive Factors for Sperm Retrieval from Males with Azoospermia who are Eligible for Testicular Sperm Extraction (TESE).”*Syst Biol Reprod Med* 66 (2020): 70-75.
6. Li, Ming-Wei, I-Ni Chiang, Yi-Kai Chang, and Shuo-Meng Wang, et al.“Sperm Retrieval Predictive Factors and Testicular Histology in Non obstructive Azoospermia Patients.”*Urological Sci* 31 (2020): 51.
7. Moradi, Mahmoudreza, Mohsen Alemi, Asaad Moradi, and Babak Izadi, et al.“Does Inhibin-B help us to Confidently Refuse Diagnostic Testicular Biopsy in Azoospermia?.”*Iran J Reprod Med 10* (2012): 243.
8. Alhalabi, Marwan. “Predictive Value of Serum Inhibin-B Levels as an Indicator of the Presence of Testicular Spermatozoa in Non-Obstructive Azoospermia.” Midd East Ferti Soc J 21 (2016): 246-252.
9. Lacey, L, Henderson S Hassan, H Hunter, and Y Sajjad, et al.“Can Preoperative Parameters Predict Successful Sperm Retrieval and Live Birth in Couples Undergoing Testicular Sperm Extraction and Intracytoplasmic Sperm Injection for Azoospermia?.” *Midd East Fertil Soc J* 26 (2021): 1-9.
10. Adamopoulos, DA, and EG Koukkou.“Value of FSH and Inhibin-B Measurements in the Diagnosis of Azoospermia’–A Clinician’s Overview.” *Int J Aandrol* 33(2010): e109-e113.
11. Medraś, Marek, Anna Trzmiel, Marcin Grabowski, and Anna Bohdanowicz-Pawlak, et al. “Inhibin B-a Marker of the Function of Male Gonad.” *Gineko Pol* 76 (2005): 484-490.

12. Nickel, Joachim, Peter Ten Dijke, and Thomas D. Mueller."TGF-βFamily Co-Receptor Function and Signaling." *Acta Biochimi Biophysi Sin* 50 (2018): 12-36.

13. Dleikh, Fouad Shareef, Ameera Jasim Al-Aaraji, Rebee Mohin, and Mazin Jaafar Mousa, et al."Possible Cause-and-Effect Linkage of Transforming Growth Factor-Beta1 and Platelets Derived Growth Factor-AB with Delayed Anthropometric Parameters in Adolescent Patients with Cooley's Anemia: Cases via Control Research Strategy." *Eur Asian J Bio Sci* 14 (2020): 1119-1125.

14. Mousa, Mazin J, Hayder Sabeeh Al Saffar, and Hayder Abdul-Amir Maki Al-Hindy."Low Level Laser (Biophotomodulation) Therapy for the Treatment of Diabetic Foot Ulcers with 532 nm KTP Laser Induces Wound Healing, Fibroblast Proliferation and Over-expression of TGF-β" *System Rev Pharmacy* 11 (2020): 396-403.

15. Al-Hindy, Hayder Abdul-Amir Makki, Mazin J Mousa, Asseel K Shaker, and Raghdan Z Al-Saad, et al."Relationship of Levels of Transforming Growth Factor-Beta1 (TGF-β1) to the Levels of Ferritin in Blood of Transfusion Dependent β-Thalassemia Major Patients with Growth Retardation: A Case-Control Study."*Eura J Biosci* 14 2020): 521-527.

16. Anderson, RA, EM Wallace, NP Groome, and AJ Bellis, et al."Physiological Relationships between Inhibin B, Follicle Stimulating Hormone Secretion and Spermatogenesis in Normal Men and Response to Gonadotrophin Suppression by Exogenous Testosterone."*Hum Reprod* 12 (1997): 746-751.

17. Simoni, Manuela, GF Weinbauer, J Gromoll, and E Nieschlag."Role of FSH in Male Gonadal Function."*Anna Endocrinol* 60, (1999): 102-106.

18. Robertson, DM, J Sullivan, M Watson, and N Cahir."Inhibin Forms in Human Plasma."*J Endocrinol* 144 (1995): 261-269.

19. Tournaye, Herman, Greta Verheyen, Peter Nagy, and Filippo Ubaldi, et al."Are there any Predictive Factors for Successful Testicular Sperm Recovery in Azoospermic Patients?."*Hum Reprod* 12 (1997): 80-86.

20. Mulhall, John P, Colleen M Burgess, Donna Cunningham, and Ronald Carson, et al."Presence of Mature Sperm in Testicular Parenchyma of Men with Non Obstructive Azoospermia: Prevalence and Predictive Factors."*Urology* 49 (1997): 91-96.

21. Ezeh, UI, HD Moore, and ID Cooke."Correlation of Testicular Sperm Extraction with Morphological, Biophysical and Endocrine Profiles in Men with Azoospermia Due to Primary Gonadal Failure."*Hum Reprod* 13(1998): 3066-3074.

22. Van Beek, Robert D, Marij Smit, Marry M van den Heuvel-Eibrink, and Frank H de Jong, et al."Inhibin B is Superior to FSH as a Serum Marker for Spermatogenesis in Men Treated for Hodgkin's Lymphoma with Chemotherapy During Childhood."*Hum Reprod* 22 (2007): 3215-3222.

23. Kumanov, Philip, Kalyana Nandipati, Analia Tomova, and Ashok Agarwal."Inhibin B is a Better Marker of Spermatogenesis than other Hormones in the Evaluation of Male Factor Infertility."*Fertil Sterility* 86 (2006): 332-338.

24. Andersson, Anna-Maria, Jørgen H Petersen, Niels Jørgensen, and Tina K Jensen, et al."Serum Inhibin B and Follicle-Stimulating Hormone Levels as Tools in the Evaluation of Infertile Men: Significance of Adequate Reference Values from Proven Fertile Men."*J Clin Endocrinol Metab* 89 (2004): 2873-2879.

25. Nowroozi, R Mohammad, Keivan radkhah, Mohsen ayati, and Hassan Jamshidian, et al."Serum Inhibin b Concentration as a Prognostic Factor for Prediction of Sperm Retrieval in Testis Biopsy of Patients with Azoospermia."*Arch Iran Med* 11(2008): 54-56.

26. Von Eckardstein, Sigrid, Manuela Simoni, Martin Bergmann, and Gerhard F Weinbauer, et al."Serum Inhibin B in Combination with Serum Follicle-Stimulating Hormone (FSH) is a More Sensitive Marker than Serum FSH Alone for Impaired Spermatogenesis in Men, but Cannot Predict the Presence of Sperm in Testicular Tissue Samples."*J Clin Endocr Metabo* 84 (1999): 2496-2501.

27. Foresta, Carlo, Andrea Bettella, Felice Petraglia, and Matteo Pistorello, et al."Inhibin B Levels in Azoospermic Subjects with Cytologically Characterized Testicular Pathology."*Clin Endocrinol* 50 (1999): 695-701.

28. Anderson, Richard A, D Stewart Irvine, Claire Balfour, and Nigel P Groome, et al."Inhibin B in Seminal Plasma: Testicular Origin and Relationship to Spermatogenesis." *Hum Repro* 13 (1998): 920-926.

29. Wallace EM, GN, Riley SC, Parker Ac, and Wu Fcw. "Effects of Chemotherapy-Induced Testicular Damage on Inhibin, Gonadotropin and Testosterone Secretion: A Prospective Longitudinal Study." *J Clin Endocrinol Metab* 83 (1997): 675–81.

30. Anawalt, Bradley D, Richard A Bebb, Alvin M Matsumoto, and Nigel P Groome et al."Serum Inhibin B Levels Reflect Sertoli Cell Function in Normal Men and Men with Testicular Dysfunction." *J Clin Endocri Metabol* 81 (1996): 3341-3345.

31. Jahromi, Bahia Namavar, Shahryar Zeyghami, Mohammad Ebrahim Parsanezhad, and Parvin Ghaemmaghami, et al."Determining an Optimal Cut-Off Value for Follicle-Stimulating Hormone to Predict Microsurgical Testicular Sperm Extraction Outcome in Patients with Non-Obstructive Azoospermia."*Arch Endocrinol Metabo* 64 (2020): 165-170.

32. Jensen, Tina Kold, Anna-Maria Andersson, Niels Henrik I Hjollund, and Thomas Scheike, et al."Inhibin B as a Serum Marker of Spermatogenesis: Correlation to Differences in Sperm Concentration and Follicle-Stimulating Hormone Levels. A Study of 349 Danish Men." *J Clin* Endo *Metabo* 82 (1997): 4059-4063.

33. Corinne, Tchoula Mamiafo, Pieme Constant Anatole, and Ngogang Yonkeu Jeanne."Comparison of Serum Inhibin B and Follicle-Stimulating Hormone (FSH) level Between Normal and Infertile Men in Yaounde." *Int J Reprod Med* 23 (2020):4765809.

34. Ziaei, Seyed Amirmohsen, Mohammadreza Ezzatnegad, Mohammadreza Nowroozi, and Hasan Jamshidian, et al."Prediction of Successful Sperm Retrieval in Patients with Non Obstructive Azoospermia."3 (2006): 92-96.

35. Modarresi, Tahereh, Hani Hosseinifar, Ali Daliri Hampa, and Mohammad Chehrazi, et al."Predictive Factors of Successful Microdissection Testicular Sperm Extraction in Patients with Presumed Sertoli Cell only Syndrome."Int *J Fertil Steril* 9 (2015): 107.

36. Chen, Shyh-Chyan, Ju-Ton Hsieh, Hong-Jeng Yu, and Hong-Chiang Chang."Appropriate Cut-Off Value for Follicle-Stimulating Hormone in Azoospermia to Predict Spermatogenesis." *Reprod Bio Endocrinol* 8 (2010): 1-5.

37. Kalsi, Jas, Meen-Yau Thum, Asif Muneer, and Hossam Abdullah, et al. "In the Era of Micro-Dissection Sperm Retrieval (m-TESE) is an Isolated Testicular Biopsy Necessary in the Management of Men with Non-Obstructive Azoospermia?." *BJU Int* 109 (2012): 418-424.

How to cite this article: Al-Bdairi, Adnan AH , Hayder AbdulAmir Makki Al-Hindy, and Mohend AN Al-Shalah "Preoperative Measures of Serum Inhibin B, and FSH Levels Predict Sperms Retrieval Outcome in Non-Obstructive Azoospermic Males" *Clin Schizophr Relat Psychoses* 15(2021). Doi: 10.3371/CSRP.AA.280721.