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Original Research Article

An Evaluation of the Relationship between Hyperprolactinemia and Abnormalities in Seminal Fluid Analysis in Male Partners of Infertile Couples Undergoing Infertility Treatment in Southern Nigeria

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Abstract

***Background*:** Male infertility is a significant yet under-reported public health concern. It affects 30% of couples who regularly engage in unprotected sexual activity. In Nigeria, the male partner is sometimes unwilling to have a fertility evaluation, which results in the underreporting of male infertility. The female partner is frequently held responsible for infertility. Hyperprolactinaemia has been identified as a reversible cause of male infertility, which is amenable to treatment, but studies to evaluate the concept are sparse. ***Aim*:** To determine if there is an association between high prolactin levels and abnormal seminal fluid analysis parameters. ***Methods*:** The study is a cross-sectional analytical study involving male partners of infertile couples. Two hundred and thirty-three (233) patients that met the inclusion criteria and gave informed consent were enrolled on the study at the Human Reproduction and Research Program Unit (HRRP) of the University of Benin Teaching Hospital, Benin-city, Nigeria. A detailed history was taken, and a physical examination was done for all subjects. Seminal fluid analysis was done for all subjects, and blood was also collected for serum prolactin assay. Information was obtained from sociodemographic data and medical history. Data obtained using interviewer-administered questionnaires were analyzed with SPSS Package version 20.0. ***Results*:** The study included 233 patients, with a mean age of 40.77.1 and a majority (57.7%) of the subjects with aberrant SFA between the ages of 40 and 49. Participants with normal and abnormal SFA had hyperprolactinemia at 4.3% and 14.2%, respectively. There was a significant negative correlation between prolactin level, motility (r=-0.010, p=0.001), morphology (r=-0.077, p=0.001) and sperm count (r=-0.082, p=0.003). Obesity, alcohol consumption and smoking were significant predictors of abnormal sperm parameters (p=0.011, p=0.001, and p=0.001, respectively). ***Conclusion*:** This study indicated a relationship between hyperprolactinaemia, sperm count, motility, and morphology, which suggests that increased prolactin may negatively affect semen quality if left untreated.

Keywords: Hyperprolactinaemia, seminal fluid analysis, male infidelity.

INTRODUCTION

Infertility is a global public health and social problem, especially in developing countries like Nigeria, where childbirth is highly valued (Osaikhuwuomwan James and Osemwenkha Abieyuwa 2015). Around 17.5% of the adult population, approximately 1 in 6 worldwide, will experience infertility at some stage(Organization 2023). A report from Africa reveals that infertility is a significant issue in reproductive health and a frequent cause of gynaecological presentation(Madziyire, Magwali *et al.*, 2021). Due to socio-cultural beliefs, it is common in Nigeria to blame women for infertility, even though there is scientific data to suggest that in 40 – 50% of infertile couples, the male is the only factor contributing to infertility (Kumar and Singh 2015, Uadia and Emokpae 2015). In Sub-Saharan Africa, little has been done to address the causes of male infertility, even though research on the causes of infertility in females has been extensively conducted (Uadia and Emokpae 2015, Sharma 2017).

The causes of infertility could either be male, female or combined. Male infertility becomes important when identifiable female causes of infertility are excluded, especially when there is abnormal semen quantity and quality based on World Health Organization criteria 2021(Organization 2023). However, no associated risk factors are identifiable in about 40-50% of males (Oladosu, Biliaminu *et al.*, 2017, Onyebuchi, Ifeoma *et al.*, 2018, Juneja, Phukan *et al.*, 2019). This is worse in third-world countries with a paucity of facilities for detailed investigations (Kaiser 2012, Juneja, Phukan *et al.*, 2019).

The capability of a man to impregnate a woman depends on his ability to produce and ejaculate semen with optimal parameters, and this depends on the proper functioning of the hypothalamic-pituitary-gonadal axis, just as is the case in females. Any hormonal imbalance can potentially impact spermatogenesis and gonad genesis in general (Tritos and Klibanski 2019, Babakhanzadeh, Nazari *et al.*, 2020). Elevated prolactin levels affect folliculogenesis by altering the normal pulsatile release of gonadotrophin-releasing hormone from the hypothalamus, consequently resulting in anovulatory infertility in the female population (Balen, Morley *et al.*, 2016).

The influence of elevated prolactin on the hypothalamic-pituitary-gonadal axis and, by extension, abnormal sperm parameters is the subject of debate in the literature (Shahroona, Fatima *et al.*, 2007, Balen, Morley *et al.*, 2016, Kutlešić, Popović *et al.*, 2016, Ahmed and Ahmed 2017, Samperi, Lithgow *et al.*, 2019).

Prolactin is thought to work by suppressing the pulsatile production of gonadotropin-releasing hormone, which lowers follicle-stimulating, luteinizing, and testosterone (Hasan and Wijesinghe 2016, O'Leary 2020). Additionally, it may halt spermatogenesis and affect the quality of the semen (Anawalt 2013). Prolactin is synthesized in the anterior lobe of the hypophyseal gland. It is a hormone that affects sexual and metabolic functions and stimulates testicular function in men (Anawalt 2013, Hasan and Wijesinghe 2016). Less than 20ng/ml of serum prolactin is normal (Wong, Eloy *et al.*, 2015). A myriad of factors other than disease conditions can affect serum prolactin levels (Benjamin, Akhere *et al.*, 2014, Wong, Eloy *et al.*, 2015). Men's prolactin levels are affected by stress, coitus, the use of oestrogens, progesterone, and androgens, as well as some medications like risperidone, metoclopramide, phenothiazines, and thyrotrophin-releasing hormones (Anawalt 2013, Balen, Morley *et al.*, 2016, Tritos and Klibanski 2019). L-dopa and bromocriptine can lower prolactin levels (Wong, Eloy *et al.*, 2015, Samperi, Lithgow *et al.*, 2019).

Emerging evidence (Benjamin, Akhere *et al.*, 2014, Ajah, Ozumba *et al.*, 2016) revealed that 35% of male factors infertility do not have any identifiable cause at presentation. It is apt to investigate the cause of infertility, including abnormal parameters, on a semen analysis (Benjamin, Akhere *et al.*, 2014, Ajah, Ozumba *et al.*, 2016, Abdulhadi, Kawo *et al.*, 2021). Apart from patients with varicocele, a potential cause of infertility in Nigeria, most patients lack a definite cause, with poor semen quality accounting for 20–48% (Abdulhadi, Kawo *et al.*,2021).

Current management aims to increase the couple's fertility potential. One of the ways to achieve this in males is to identify obvious risk factors and some less apparent links but whose treatment may be advantageous, like hyperprolactinemia (Ajah, Ozumba *et al.*, 2016, Abdulhadi, Kawo *et al.*, 2021). Therefore, it becomes imperative to determine the association between hyperprolactinaemia and seminal fluid analysis abnormalities of male partners of infertile couples attending the infertility clinic at the University of Benin Teaching Hospital, Benin City.

The study was carried out to determine the association between high prolactin levels (hyperprolactinaemia) and abnormal seminal fluid analysis parameters among males attending the infertility clinic at the University of Benin Teaching Hospital.

MATERIALS AND METHODS

The prospective cross-sectional analytical study was conducted at the Human Reproduction and Research Programme (HRRP) unit of the Obstetrics and Gynaecology department of the University of Benin Teaching Hospital, Benin City, amongst male partners of infertile couples attending the clinic. The study was conducted from Oct 1 2021, to Mar 31 2023. The participants were voluntarily enrolled after counselling on; the nature of the study, the amount of blood/semen to be used, the benefits of the study, maintaining anonymity and their decision or not to participate in the study would not affect their care. The interview was conducted privately in the serene environment of HRRP. The social classification was according to the revised scheme by Ibadin and Akpede (Ibadin and Akpede 2021). All consenting infertile males were recruited until the sample size was completed. Data was obtained with an interviewer-administered structured questionnaire. Data was entered using Statistical Package for scientific solution (SPSS) Statistical Software Version 20. A statistical significance test was done at $p < 0.05$, while the confidence interval was constructed at a 95% confidence limit. The result of the analysis was presented as frequency distribution tables and figures.

RESULTS

There were 58 (24.9%) participants with normal seminal fluid analysis (SFA), 175 (75.1%) had abnormal SFA and 43 (18.5%) cases of hyperprolactinaemia among the study population.

The mean age of participants in the study was 40.7 ± 7.1 years. The difference between the mean ages of the participants with normal and abnormal SFA (38.8 ± 6.9 vs 42.5 ± 8.2 years, p-value= 0.305) was not statistically significant. The other socio-demographic characteristic, such as level of education, social class and duration of infertility among the participants with normal and abnormal SFA, were similar with no statistically significant difference—table 1a.

Table 1a: Demographic Characteristics of Study Population

	Study Population N = 233 (%)	Normal SFA n= 58 (%)	Abnormal SFA n=175	χ^2 Test	P –value
Age Group (Years)					
30-39	92 (39.5)	32 (55.2)	60 (34.3)	1.642	0.801
40-49	120 (51.5)	19 (32.8)	101 (57.7)		
50-59	14 (6.0)	5 (8.6)	9 (5.1)		
60-69	5 (2.1)	2 (3.4)	3 (1.7)		
≥70	2 (0.9)	0 (0.0)	2 (1.1)		
Mean ± SD	40.7±7.1	38.8±6.9	42.5 ±8.2	1.033	0.305
Educational Status					
No formal education	0 (0.0)	0(0.0)	0(0.0)	0.832	0.660
Completed Primary	21 (9.0)	6(10.3)	15(8.6)		
Completed Secondary	55 (23.6)	9(15.5)	46(26.3)		
Tertiary	157 (67.4)	43(74.1)	114(65.1)		
Social class					
I	116 (49.8)	34(58.6)	82(46.8)	7.655	0.105
II	39 (16.7)	4(6.9)	35(20.0)		
III	51 (21.9)	11(18.9)	40(22.9)		
IV	11 (4.7)	6(10.3)	5(2.9)		
V	16 (6.9)	3(5.2)	13(7.4)		
Duration of Infertility (Yrs)					
1 – 5	97(41.6)	17(29.3)	80(45.7)	2.007	0.503
6 – 10	105 (45.1)	35(60.3)	70(40.0)		
11 – 15	27 (11.6)	4(6.9)	23(13.1)		
16 – 20	4 (1.7)	2(3.4)	2(1.1)		

Table 1b: Clinical Characteristics of Study Population

	Study Population N = 233 (%)	Normal SFA n= 58 (%)	Abnormal SFA n=175(%)	χ^2 Test	P – value
Smoking status					
Yes	44 (18.9)	7(12.1)	37(21.1)	13.890	0.001
No	189 (81.1)	51(87.9)	138(78.9)		
Alcohol					
Yes	85 (36.5)	12(20.7)	73(41.7)	40.258	0.001
No	148 (63.5)	46(79.3)	102(58.3)		
Body Mass Index					
Underweight	0 (0.0)	0(0.0)	0(0.0)	6.420	0.011
Normal	67 (28.8)	22(37.9)	45(25.7)		
Overweight	109 (46.8)	31(53.4)	78(44.6)		
Obese	57 (24.4)	5(8.6)	52(29.7)		
Previous pelvic or groin Surgery					
Yes	9 (3.9)	0(0.0)	9(5.1)	0.036	0.850
No	224 (96.1)	58(100.0)	166(94.9)		
Previous history of Varicocoele					
Yes	3 (1.3)	0(0.0)	3(1.7)	1.007	0.316
No	230 (98.7)	58(100.0)	172(98.3)		
Previous Infections like urethritis					
Yes	2 (0.9)	0(0.0)	2(1.1)	0.669	0.414
No	231 (99.1)	58(100.0)	173(98.9)		
Chronic medical illness					
Yes	27 (11.6)	5(8.6)	22(12.6)	0.052	0.820
No	206 (88.4)	53(91.4)	153(87.4)		

When compared to persons with normal SFA, a substantially more significant percentage of participants who smoked cigarettes, drank alcohol and were obese had aberrant SFA parameters (21.1%, 41.7%, and 29.7% vs 12.1%, 20.7%, and 8.6%, with p-values of 0.001, 0.001, and 0.011, respectively).

Other clinical traits, such as prior groin surgery, previous pelvic infection, history of varicocele, and prior chronic medical illness, were comparable and did not statistically differ between people with normal and abnormal SFA (Figure 1b).

Table 2: Association between Prolactin levels and seminal fluid analysis abnormalities

	Study population N=233	Abnormal SFA n = 175, N (%)	Normal SFA n = 58, N (%)	χ^2 Test	p-value
Prolactin level					
Hyperprolactinaemia	43 (18.5)	33 (18.9)	10 (17.2)	9.053	0.003
Normal Prolactin	190 (81.5)	142 (81.1)	48 (82.8)		

There were 43 cases of hyperprolactinemia, with a prevalence rate of 18.5 per cent overall. Hyperprolactinaemia was more in men with abnormal SFA—14.2% (33/233) versus 4.3% (10/233) in those with normal SFA. Compared to 10 (17.2%) patients with normal SFA and hyperprolactinaemia, 33 (18.9%) participants had abnormal SFA and hyperprolactinaemia. The proportional difference was statistically significant at a p-value of 0.003 (Table 2).

In comparison to people with normal prolactin levels, a substantially more significant percentage of those with hyperprolactinaemia had abnormal sperm count (93% vs. 71%; p-value = 0.003), sperm morphology (90.7 vs. 60.5; p-value = 0.001), and sperm motility (93% vs. 58.9%; p-value = 0.001).

Table 3: Relationship between prolactin level and sperm parameters

Variable	Prolactin groups Number (Percentage)		Unadjusted Odds ratio	95% CI for the Odds ratio	*p*-value
	Hyperprolactinaemia	Normal			
Sperm count					
Abnormal	40 (93.0)	135 (71.1)	0.184	0.055 – 0.620	0.003
Normal	3 (7.0)	55 (28.9)			
Sperm morphology					
Abnormal	39 (90.7)	115 (60.5)			
Normal	4 (9.3)	75 (39.5)	0.157	0.054 – 0.458	0.001
Sperm motility					
Abnormal	40 (93.0)	112 (58.9)	0.108	0.032 – 0.361	0.001
Normal	3 (7.0)	78 (41.1)			

Participants with hyperprolactinaemia were likelier to have abnormal sperm count, morphology, and motility by an odds ratio of 0.184, 0.157, and 0.108, respectively, and statistically significant (Table 3).

Prolactin level, sperm count, sperm motility, and sperm morphology were all found to have non-significant negative correlations in individuals with normal SFA parameters (r=-0.525, p=0.053, -0.009, and -0.209, respectively). Conversely, a significant negative correlation was seen between prolactin level and sperm count (r = - 0.082, p = 0.003), sperm motility (r = - 0.010, p=0.001), and sperm morphology (r = - 0.077, p=0.001) in contrast, among individuals with abnormal SFA.

Table 4 and Figures 1 to 3

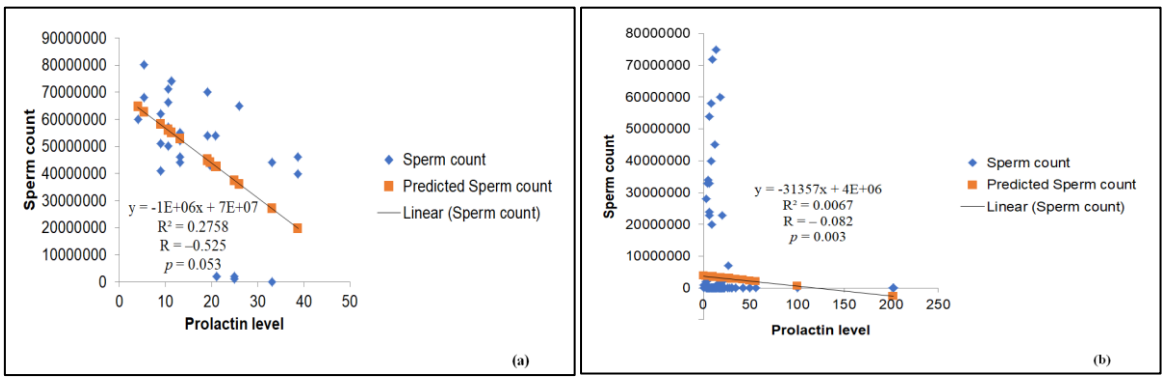

Figure 1: Scatter plot showing the correlation of prolactin level and sperm count in participants with (a) normal SFA (b) abnormal SFA

Table 4: Correlation matrix of prolactin level vs SFA parameters in participants with normal SFA and those with abnormal SFA

SFA			Prolactin level	Sperm count	Sperm motility	Sperm morphology
Normal SFA	**Prolactin level**	*r*	1	-.525*	.009	-.209
		p		.003	.964	.277
		N	58	58	58	58
	Sperm count	*r*	-.525*	1	.029	.270
		p	.053		.881	.157
		N	58	58	58	58
	Sperm motility	*r*	-.009	.029	1	-.303
		p	.964	.881		.111
		N	58	58	58	58
	Sperm morphology	*r*	-.209	.270	-.303	1
		p	.100	.157	.111	
		N	58	58	58	58
Abnormal SFA	**Prolactin level**	*r*	1	-.082	.010	-.077
		p		.244	.884	.276
		N	175	175	175	175
	Sperm count	*r*	-.082	1	.183*	.008
		p	.003		.009	.911
		N	175	175	175	175
	Sperm motility	*r*	-.010	.183*	1	.071
		p	.001	.884		.313
		N	175	175	175	175
	Sperm morphology	*r*	-.077	.008	.071	1
		p	.001	.911	.313	
		N	175	175	175	175

r = Correlation coefficient * $p < 0.05$ *p* = probability value N = Frequency

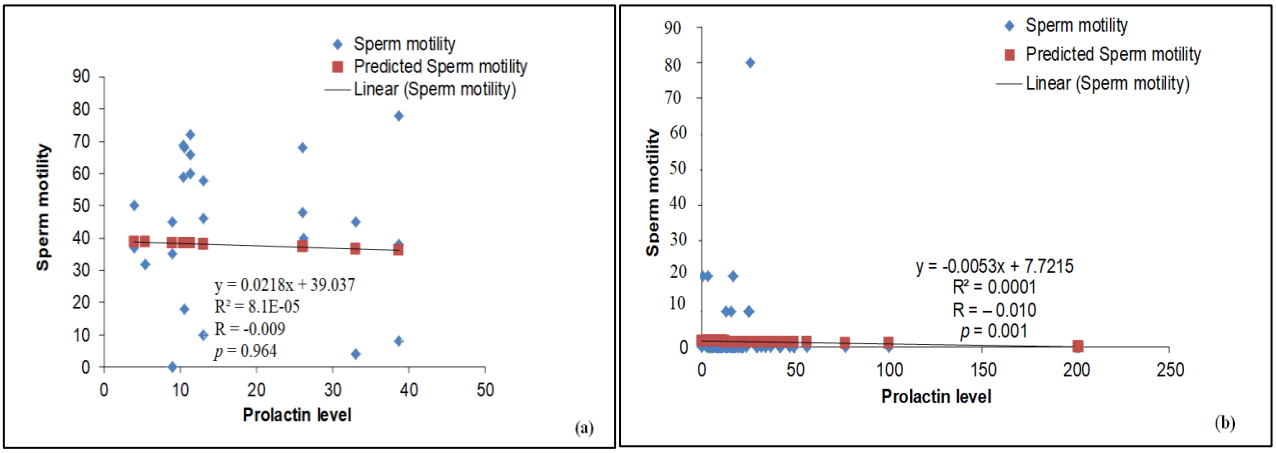

Figure 2: Scatter plot showing the correlation of prolactin level and sperm motility in participants with (a) normal SFA and (b) abnormal SFA

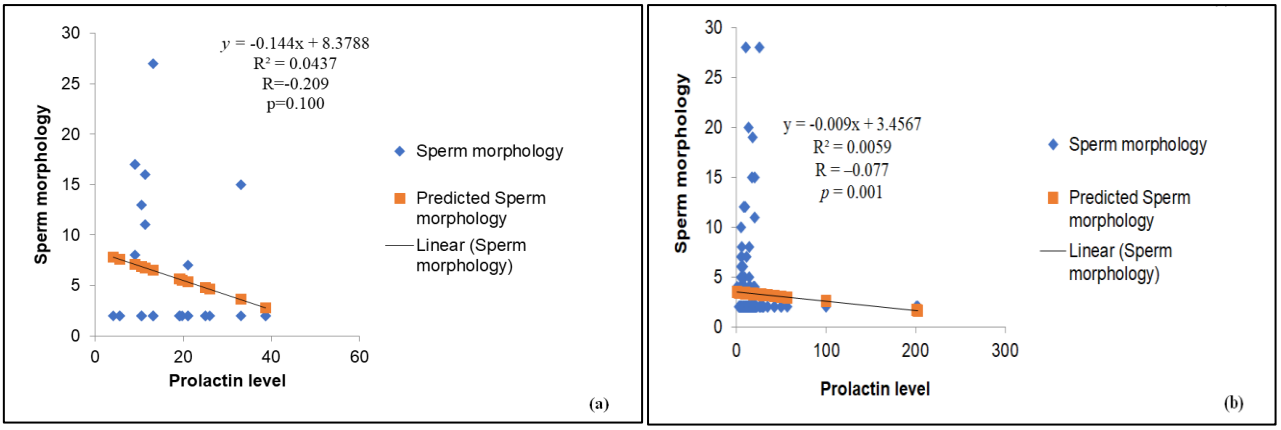

Figure 3: Scatter plot showing the correlation of prolactin level and sperm morphology in participants with (a) normal SFA and (b) abnormal SFA

Table 5: Binary logistic regression analysis of factors associated with abnormal sperm count among the study population

Variable	B-regression Coefficient	Odds ratio	95% CI for the Odds ratio	p-value
Prolactin levels				
Hyperprolactinaemia	-1.692	0.184	0.055 – 0.620	0.006
Normal prolactin				
Obesity				
Yes	1.070	2.914	1.239 – 6.855	0.014
No*				
Previous groin surgery				
Yes	0.154	1.167	0.235 – 5.780	0.850
No*				
Age >50years				
Yes	-0.099	0.905	0.277 – 2.961	0.870
No*				
Alcohol				
Yes	3.963	52.615	7.126 – 388.467	0.001
No*				
Infections like urethritis				
Yes	20.110	5416.047	0.001	0.999
No*				
Smoking				
Yes	2.301	9.984	2.342 – 42.567	0.002
No*				
Chronic medical illness(Htn, DM)				
Yes	0.112	1.118	0.426 – 2.935	0.820
No*				
Previous varicocele				
Yes	20.116	5447.536	0.001	0.999
No*				

CI= Confidence interval *Reference category

Binary logistics regression analysis of factors associated with abnormal sperm morphology showed that hyperprolactinaemia, obesity, alcohol consumption and smoking were significant predictors of abnormal sperm morphology (p-value=0.001, 0.001, 0.001, 0.001) and were more likely to cause abnormality in sperm morphology by odds of 0.157, 0.284, 28.852 and 16.398 respectively. Furthermore, there was a non-significant trend for other predictors of abnormal sperm morphology (previous groin surgery, pelvic infection, age, varicocele and chronic medical illness) (Table 5).

Table 6: Binary logistic regression analysis of factors associated with abnormal sperm morphology among the study population

	B-regression Coefficient	Odd ratio	95% CI for the Odds ratio	*p*-value
Prolactin levels				
Hyperprolactinaemia	-1.850	0.157	0.054 –0.458	0.001
Normal Prolactin				
Obesity				
Yes	-1.259	0.284	0.131 – 0.615	0.001
No*				
Previous groin surgery				
Yes	0.606	1.833	0.372 – 9.040	0.457
No*				
Age > 50 years				
Yes	0.366	1.442	0.444 – 4.684	0.542
No*				
Alcohol				
Yes	8.362	28.852	8.722 –95.442	0.001
No*				
Infections like urethritis				
Yes	20.548	8396.23	0.001	0.999
No*				
Smoking				
Yes	2.797	16.398	3.864 –69.599	0.001
No*				
Chronic medical illness (Htn, DM)				
Yes	0.370	1.448	0.581 – 3.606	0.427
No*				
Previous varicocele				
Yes	20.555	8451.829	0.001	0.999
No*				

CI: Confidence interval
*Reference category

Binary logistics regression analysis of factors associated with abnormal sperm count revealed that hyperprolactinaemia, obesity, alcohol consumption and smoking were significant predictors of abnormal sperm count (p- value=0.006, 0.014, 0.001 and 0.002) and were more likely by odds of 0.184, 2.914, 52.615, and 9.984 respectively to lead to an abnormality in sperm count.

Other predictors of inadequate sperm count (past groin surgery, prior pelvic infection, age, prior varicocele, and chronic disease) also showed a non-significant trend) (Table 5).

Table 7: Binary logistic regression analysis of factors associated with abnormal sperm motility among the study population

	B-regression Coefficient	Odd ratio	95% CI for the Odds ratio	*p*-value
Prolactin levels				
Hyperprolactinaemia	–2.228	0.108	0.320 – 0.361	0.001
Normal Prolactin				
Obesity				
Yes	–1.306	0.271	0.125 – 0.587	0.001
No*				
Previous groin surgery				
Yes	0.645	1.907	0.387 – 9.400	0.428
No*				
Age > 50 years				
Yes	0.068	1.070	0.353 – 3.245	0.904
No*				
Alcohol				
Yes	3.861	47.514	11.266 – 200.385	0.001

No*				
Infections like urethritis				
Yes	20.587	8723.548	0.0001	0.999
No*				
Smoking				
Yes	2.842	17.142	4.040 – 72.739	0.001
No*				
Chronic medical illness (Htn, DM)				
Yes	0.412	1.510	0.607 – 3.759	0.376
No*				
Previous varicocele				
Yes	20.593	8782.119	0.0001	0.999
No*				

CI: Confidence interval *Reference category

DISCUSSION

Participants' average age was 40.7 years, similar to the studies' average ages of 40.3(Benjamin, Akhere *et al.,* 2014), 40.5(Onyebuchi, Ifeoma *et al.,* 2018), and 41.0(Omokanye, Olatinwo *et al.*,2016) years reported by other studies. Other researchers reported higher than 37.0 years(Ahmed and Ahmed 2017) and 38.6 years(Oladosu, Biliaminu *et al.,* 2017). This observed discrepancy might be due to the different study settings and designs in these investigations. The higher mean age may be due to delayed presentation at the HRRP because it is a specialized infertility clinic/referral centre. Some clients have had initial consultations at other general gynaecological clinics before coming to the HRRP. Furthermore, most men do not readily admit their role in infertility in our culture, which always leads to the late presentation (Osaikhuwuomwan James and Osemwenkha Abieyuwa 2015).

The prevalence of hyperprolactinaemia in participants with normal seminal fluid analysis at 4.3% in this study was comparable to findings from other studies(Oladosu, Biliaminu *et al.,* 2017), higher than the (2.1%) prevalence reported from Chicago (Ambulkar, Darves-Bornoz *et al.,* 2022) However, it is lower in frequencies of 5.1%, 9.4%, and 16.7%, had been reported by Ozoemena *et al.,(Ozoemena, Ezugworie et al., 2011).*, Hasan and Wijesingle (Hasan and Wijesinghe 2016), and Green and Amadi (Green and Amadi 2020). The observed difference may be due to regional disparity, smaller sample size and subject selection criteria used. Furthermore, this study used World Health Organisation 2021 criteria for seminal fluid analysis instead of the other studies that employed the older version. Evidence has shown that the prevalence of hyperprolactinaemia varies across the globe (Emokpae, Uadia *et al.,* 2007, Ozoemena, Ezugworie *et al.,* 2011, Organization 2023)

In contrast, research from Sudan (Ahmed and Ahmed 2017) and Japan (Okada, Iwamoto *et al.*,1996) found a robust negative correlation between abnormal sperm parameters and hyperprolactinaemia. The study conducted in Sudan revealed a negative clinical correlation, which was insignificant. But it demonstrates that there might be an association between high sperm counts and elevated serum prolactin levels. Also, the study in Japan employed World Health Organization 1987 standards, which had a lower limit of 20 x 10^6/ml, as opposed to our study, which used World Health Organisation 2021 criteria, which had a lower limit of 16 x 10^6/ml.

Similarly, Dagistani (Al-Daghistani and Abdel-Dayem 2002) and Adnan *et al.,* (Al-Janabi, Al-Mehdawi *et al.*,2012) demonstrated a strong negative correlation between hyperprolactinaemia and sperm count. Since LH is crucial for stimulating steroidogenesis and spermatogenesis while FSH directly nourishes the spermatozoa, the negative correlation may indicate poor spermatogenesis in hyperprolactinaemic patients.

Evidence has shown that hyperprolactinaemia has a deleterious effect on ATP synthesis in the mitochondria, lowering the Ca+2 channels necessary for the acrosome reaction and reducing sperm motility(Al-Daghistani and Abdel-Dayem 2002). Other studies(Al-Daghistani and Abdel-Dayem 2002, Ahmed and Ahmed 2017) found a strong inverse relationship between hyperprolactinaemia and sperm motility. However, a study from Israel(Al-Janabi, Al-Mehdawi *et al.,* 2012) contradicts this.

This study demonstrates a statistically significant correlation between sperm morphology and high prolactin levels, comparable to the finding reported by ***Al-Daghistani*** *et al.,* (Al-Daghistani and Abdel-Dayem 2002). The association between prolactin levels and sperm morphology may result from prolactin's role in preserving the structural integrity of spermatozoa (Coutton, Fissore *et al.,* 2016). In proliferative cells, serum prolactin initiates the Ca^{2+} pool movement, which is crucial for gene expression, cell development, and protein synthesis—all of which are components of the standard structure and morphology of the cell (Silvestroni and Menditto 1989,

Espino, Mediero *et al.*, 2009, Tritos and Klibanski 2019). These processes are disrupted, and an aberrant prolactin level impacts sperm morphology.

Other noteworthy study results revealed that smoking, alcohol use, and obesity were all significant predictors of aberrant sperm counts (After controlling for confounding variables). In other words, a greater BMI and more alcohol use are linked to a decreased sperm count. Other researchers reported similar findings (Muthusami and Chinnaswamy 2005, Geidam, Yawe *et al.*, 2008).

The regulation of the hypothalamic-pituitary-gonadal axis is compromised by alcohol consumption and obesity. The pulsatile release of follicle-stimulating hormone and the luteinizing hormone is negatively impacted. These lower testosterone levels, reduce sperm generation and gradually damage the testicles (Asare-Anane, Bannison *et al.*, 2016).

Smoking also increases cadmium intake as tobacco plants absorb metal. As a result of its similar chemical properties to zinc, cadmium could replace zinc in DNA polymerase. The deficiency of zinc induces atrophy of seminiferous tubules, a secretory deficit of Leydig and Sertoli cells and subsequent failure of spermatogenesis(Lingappa, Govindashetty *et al.*, 2015, Asare-Anane, Bannison *et al.*, 2016).

This study has shown that hyper prolactin negatively affects the seminal fluid analysis parameters. Therefore, routine assay for serum prolactin levels for infertile men with abnormal SFA may help the couple, instead of the financially laden Assisted Reproduction Technology (ART), which is beyond the reach of most of the couples in our low-resource setting.

ETHICAL CONSIDERATION

Approval for the study was obtained from the Ethical and Research Committee of the University of Benin Teaching Hospital.

CONFLICT OF INTEREST

There was no conflict of interest in the conduct of the study.

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