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The Effects of Snuff (Toombak) on Semen Parameters among Sudanese Patients 2022

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Abstract **Background:** Men's tobacco usage may be a contributing factor in up to 12% of cases of infertility in couples due to decreased semen parameters. It is the reality that Sudan is home to the greatest number of nicotine snuffers (toombaks) worldwide. Unlike snuff, the detrimental effects of cigarette smoking on sperm parameters are well-documented, even though they apply to other smokeless nicotine products. **Aim:** to research the influence on semen variables related to toombak snuffing. **Methods:** A comparative study analysed 120 subjects, out of which 50 were toombak snuffers (cases), (mean age = 33.9±6.4 years), and 70 were non-snuffers (control), (mean age= 33.5±6.9 years) attended Hawa Fertility Centre in the period from November 2021 to November 2022. Data regarding demographics, duration of tobacco snuffing, frequency of snuffing per day, diagnosis, and seminal analysis parameters were compared between groups. **Results:** Among patients in the snuffer group, the majority of them had snuffing duration from 10–20 years (n = 20; 40%) and had snuffing frequency >20 times per day (n = 27; 54%). Compared to the control group, snuffing was a significant predictor of low count. (oligiospermia and azoospermia) (OR = 3.8; 95% CI: 1.6–9.1; P = 0.002), low motility <42% (OR = 3.6; 95% CI: 1.7–7.9; P = 0.001), low progressive motility <30% (OR = 2.0; 95%CI: 1.3-4.2; P = 0.018) and normal morphs <4% (OR = 2.7; 95%CI: 1.2-5.7; P = 0.009). The snuffing duration above 20 years was a significant risk factor for a low count. (oligiospermia and azoospermia) (OR = 16.8; 95% CI: 2.6-46.3; P = 0.003), low motility <42% (OR = 11.0; 95% CI: 2.0–60.0; P = 0.006), low progressive motility <30% (OR = 10.8; 95%CI: 1.9-59.8; P = 0.007) and normal morphs <4% (OR = 10.6; 95%CI: 2.1-60.0; P= 0.007). The snuffing frequency above 20 times per day was a significant risk factor for low count (oligiospermia and azoospermia) (OR = 7.9; 95% CI: 1.8–34.5; P = 0.008), low motility <42% (OR = 3.4; 95% CI: 1.7–12.1; P = 0.041), low progressive motility <30% (OR = 4.1; 95% CI: 1.1–14.9; P = 0.033), but not normal morphs <4% (P = 0.083). **Conclusion:** Toombak snuffing had a major detrimental impact on spermatogenesis, which in turn affected sperm motility, measure, and shape. Furthermore, longer duration (>20 years) and intensive toombak snuffing use (>20 times per day) were significantly correlated with low motility, shape, and quantity of sperm.

Key Words Toombak, snuff, semen parameters, Sudan, infertility, sperm motility, oligospermia, azoospermia, tobacco usage, smokeless nicotine

1. Introduction

A growing number of women are experiencing infertility, which is both a societal and health issue with 35–40% of male partners being the only ones at fault [1]. Male infertility has many known traditional causes, such as endocrine system disruption, anatomy, genetics, varicocele or torsion, developing diabetes, and subtle unknown infections. Other causes include chronic contact with toxic chemicals and different unhygienic lifestyle patterns [2]. One lifestyle choice that frequently has a negative impact on people's overall health

is smoking [3].

The leaves of the Nicotiana rustica species are used to make Sudanese Toombak, a smokeless tobacco product that is used loose and wet. The leaves are combined with a water-based solution of sodium bicarbonate. Toombak tapping is a common practice among the several ethnic groups in Sudan, each of which has its own social and economic standing. It has a significant quantity of nicotine, a high PH, and a high concentration of the compounds unique to tobacco [4].

In Sudan, snuffing (toombak) is a common practice. In comparison to urban regions, the prevalence of toombak usage among males aged 18 and older was much greater in rural areas (35% vs. 24%). The male population aged 30 and above had the greatest rates of toombak usage (mean 46.6%, range 45–47%) in rural regions [5].

The usage of smokeless tobacco has grown recently, which may be related to the lower semen quality linked to oral tobacco snuffing. However, the specific ingredient that may have contributed to the lower semen quality is unknown [6], [7]. There is ongoing debate on the link between male infertility and cigarette use. Numerous studies have demonstrated that smoking damages DNA and has a negative impact on sperm concentration, motility, and morphology [8].

In 2022, the study intends to look at how Sudanese patients' semen parameters are affected by toombak snuffing. It will specifically examine the relationships between sperm count, motility, morphology, frequency, and duration of toombak snuffing [9].

2. Methodology

A comparative case-control hospital-based research was conducted at Hawa Fertility Center at Khartoum state, the research duration spanned from November 2021 to November 2022. The study population comprised patients who underwent semen analysis at the center during this time frame. Inclusion criteria for the study stipulated that cases included suffering patients aged between 18 and 45 years, while controls consisted of non-suffering patients within the same age range. Exclusion criteria encompassed patients with previously identified causes of abnormal semen parameters (such as varicocele, endocrine issues, and sperm transport problems), those with seminal volume less than 1.5 ml, smokers, overweight patients, and individuals unwilling to participate in the study [10].

The sample size included a total of 120 patients meeting the inclusion criteria, fifty in the group that was suffering and seventy in the group that wasn't. Data collection tools and methods were implemented by the principal investigator, utilizing structured questionnaires covering demographics, duration and frequency of tobacco snuffing, diagnosis, and seminal analysis parameters. Study variables were classified into independent variables—comprising demographics (age, marital status, occupation), duration and frequency of tobacco snuffing, and diagnosis—and dependent variables focusing on semen analysis parameters like count, motility, and morphology [10].

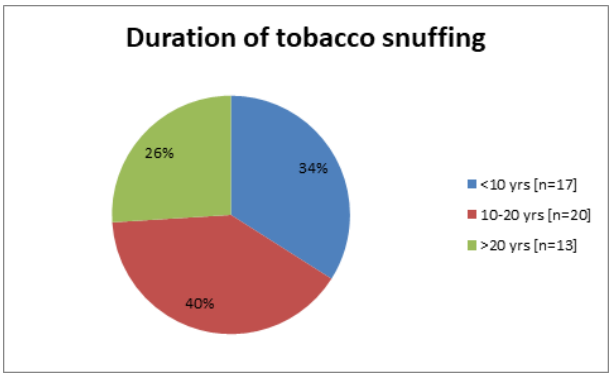

Figure 1: The tobacco snuffing duration among of patients in snuffers group (N=50)

	Snuffer (N=50)	Non-snuffer (N=70)	Total (N=120)	P
Age (Yes); mean±SD	33.9±6.4	33.5±6.9	33.7±6.7	
· <20	0(0%)	1(1.4%)	1(0.8%)	0.861
· 20-29	16(32%)	23(32.9%)	39(32.5%)	
· 30-39	21(42%)	28(40%)	49(40.8%)	
· 40+	13(26%)	18(25.7%)	31(25.8%)	

Table 1: The age of patients in snuffers and non- snuffers groups

Software called the Statistical Package for Social Sciences (SPSS V. 21.0) was used to analyze the data. The data analysis results are displayed in Microsoft Excel 2010 tables and figures. For categorical variables, the chi-square test was utilized as a significance test, while the t-test was employed for continuous variables. To determine the variables linked to anomalies in semen, logistic regression was employed. At the 0.05 level, the P-value was deemed significant [10].

A. Moral reflection

The Sudan Medical Specialization Board (SMSB) granted ethical approval. It was being approved and accepted by the hospital authorities. In order to preserve patient identify, data is utilized anonymously and is stored securely in a separate file using identity numbers rather than names. Study papers do not mention any specific participants. The research personnel were the only ones who knew the subjects' identities.

3. Results

In total this study enrolled 120 male subjects, 50 were snuffers (mean age= 33.9±6.4 years) and 70 were non-snuffers (mean age= 33.5±6.9 years) (Table 1). Among patients in snuffer group, the majority of them 20(40%) had snuffing duration from 10-20 years (Figure 1). The frequency of snuffing per day was majorly >20 times in almost half (n=27; 54%) of the patients in snuffer group (Figure 2).

Most of the patients in snuffer group (n= 31; 62%) and non-snuffer group (n= 39; 55.7%) were workers without statistical significant difference (P= 0.788) (Table 2).

The vast majority of the patients in snuffer group (n= 41; 82%) and non-snuffer group (n= 56; 80%) were married without statistical significant difference (P= 0.788). them of marriage duration was 3.7±2.5 years in snuffer group and

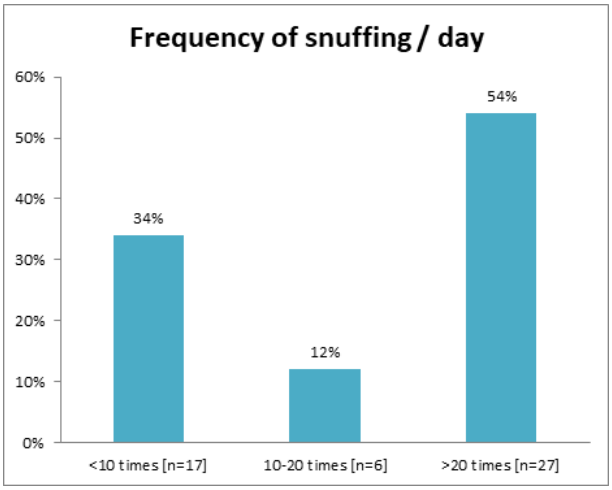

Figure 2: The tobacco snuffing frequency of patients in snuffers group (N=50)

	Snuffer (N=50)	Non-snuffer (N=70)	Total (N=120)	P
Occupation				
· Worker	31(62%)	39(55.7%)	70(58.3%)	0.788
· Employee	13(26%)	23(32.9%)	36(30%)	
· Farmer	4(8%)	4(5.7%)	8(6.7%)	
· Student	2(4%)	4(5.7%)	6(5%)	

Table 2: The occupations of patients in snuffers and non-snuffers groups

4.9±3.4 years in non-snuffer group (P= 0.057). About one-half of patients in snuffer group (n=25; 50%) and 31(44.3%) of those in non0snuffer group had had one or more offspring (P= 0.142). The mean age of last offspring was 1.7±1.4 years in snuffer group and 3±2.3 years in non-snuffer group (P= 0.067) (Table 3).

The majority of the cases in snuffer group (n=24; 48%) and non-snuffer group (n=31; 44.3%) had primary infertility, without statistical significant difference (P= 0.331) (Table 4).

As shown in Figure 3, the rate of azoospermia and oligiospermia was significantly higher among the patients in

	Snuffer (N=50)	Non-snuffer (N=70)	Total (N=120)	P
Marital status				
· Married	41(82%)	56(80%)	97(80.8%)	0.488
· Single	9(18%)	14(20%)	23(19.2%)	
Marriage duration (yrs); mean±SD	3.7±2.5	4.9±3.4	4.4±3.1	0.057
Offspring number				
· Nil	25(50%)	31(44.3%)	56(45.7%)	0.142
· One	13(26%)	11(15.7%)	24(20%)	
· ≥Two	3(6%)	14(20%)	17(14.2%)	
Age of last offspring (yrs); mean±SD	1.7±1.4	3±2.3	2.5±2.1	0.067

Table 3: The marital status of patients in snuffers and non-snuffers groups

	Snuffer (N=50)	Non-snuffer (N=70)	Total (N=120)	P
Diagnosis				
· Primary infertility	24(48%)	31(44.3%)	55(45.8%)	0.331
· Secondary infertility	6(12%)	16(22.9%)	22(18.3%)	
· Fertile	10(20%)	8(11.4%)	18(15%)	

Table 4: The diagnosis of patients in snuffers and non-snuffers groups

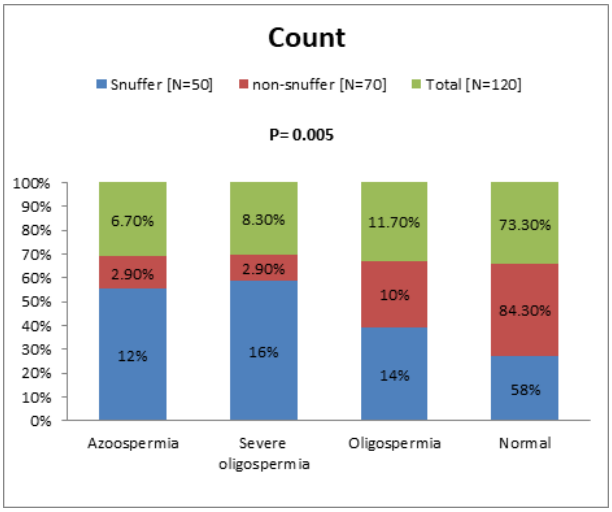

Figure 3: The sperm count among patients in snuffers and non- snuffers groups

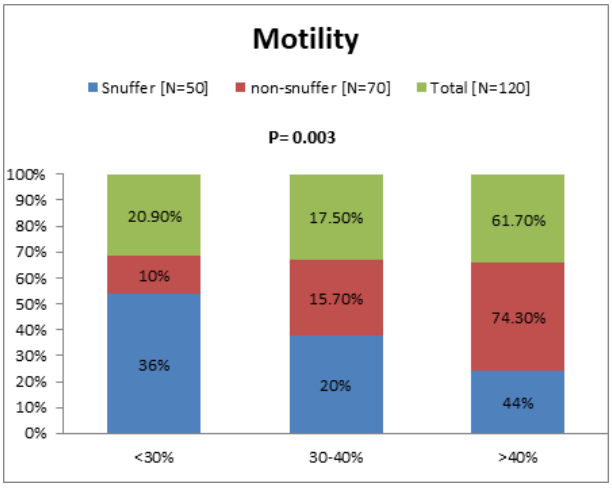

Figure 4: The total sperm motility among patients in snuffers and non- snuffers groups

snuffer groups more than those in non-snuffer group (42% vs 15.8%; P= 0.005).

Figure 4 showed that the low sperm motility ranges (<40%) were significantly greater among the patients in snuffer groups more than those in non-snuffer group (56% vs 25.7%; P= 0.003).

Also, the low sperm progressive motility ranges (<30%) were significantly greater among the patients in snuffer groups more than those in non-snuffer group (56% vs 25.7%; P= 0.003) (Figure 5).

Figure 6 revealed that the rate of normal morphs <4% was significantly higher among the patients in snuffer groups more than those in non-snuffer group (60% vs 35.8%; P= 0.014).

The logistic regression analysis showed that snuffing was significant predictor for low count (oligiospermia and azoospermia) (OR= 3.8; 95%CI: 1.6-9.1; P= 0.002), low

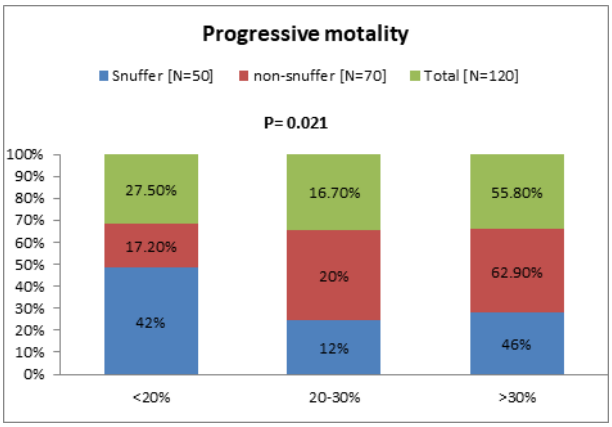

Figure 5: The progressive motility among patients in snuffers and non- snuffers groups

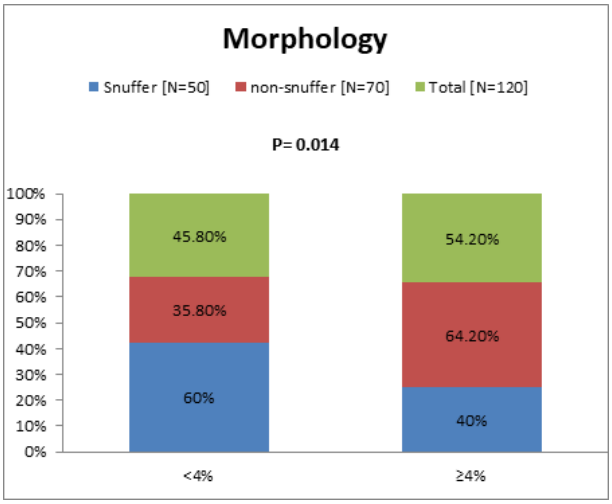

Figure 6: The sperm morphology among patients in snuffers and non- snuffers groups

motility <42% (OR= 3.6; 95%CI: 1.7-7.9; P= 0.001), low progressive motility <30% (OR= 2.0; 95%CI: 1.3-4.2; P= 0.018) and normal morphs <4% (OR= 2.7; 95%CI: 1.2-5.7; P= 0.009) (Table 5).

The semen analysis parameters in term of count (P= 0.370), motility (P= 0.297), progressive motility (P= 0.490) and morphology (P= 0.560) were not significantly correlated with age of the patients in snuffer group (Table 6) .

Table 7 & 8 showed that, the snuffing duration above 20 years was significant risk factor of low count (oligiospermia and azoospermia) (OR= 16.8; 95%CI: 2.6-46.3; P= 0.003), low motility <42% (OR= 11.0; 95%CI: 2.0-60.0; P= 0.006), low progressive motility <30% (OR= 10.8; 95%CI: 1.9-59.8; P= 0.007) and normal morphs <4% (OR= 10.6; 95%CI: 2.1-60.0; P= 0.007).

Snuffer vs non-snuffer	OR	95%CI	P
Low count (oligiospermia and azoospermia)	3.8	1.6-9.1	0.002
Motility (<42%)	3.6	1.7-7.9	0.001
Progressive motility (<30%)	2.0	1.3-4.2	0.018
Morphology (<4%)	2.7	1.2-5.7	0.009

Table 5: The logistic regression show comparison of semen characteristics between those that were snuffed and those that weren't

	Age (Yrs)			P
	20-29	30-39	40+	
Count				
· Azoospermia	1(6.3%)	2(9.5%)	3(23.1%)	0.370
· Severe oligiospermia	1(6.3%)	3(14.3%)	4(30.8%)	
· Oligiospermia	3(18.8%)	3(14.3%)	1(7.7%)	
· Normal	11(68.8%)	13(61.9%)	5(38.5%)	
Mortality				
· <30%	3(18.8%)	9(42.9%)	6(46.2%)	0.297
· 30-42%	5(31.3%)	2(9.5%)	3(23.1%)	
· >42%	8(50%)	10(47.6%)	4(30.8%)	
Progressive motility				
· <20%	5(31.3%)	9(42.9%)	7(53.8%)	0.490
· 20-30%	3(18.8%)	1(4.8%)	2(15.4%)	
· >30%	8(50%)	11(52.4%)	4(30.8%)	
Morphology				
· <4%	8(50%)	13(61.9%)	9(69.2%)	0.560
· ≥4%	8(50%)	8(38.1%)	4(30.8%)	

Table 6: The association between semen analysis parameters and age of patents in snuffer group

	Snuffing duration (Yrs)			P
	<10	10-20	>20	
Count				
· Azoospermia	0(0%)	3(15%)	3(23.1%)	0.015
· Severe oligiospermia	0(0%)	3(15%)	5(38.5%)	
· Oligiospermia	2(11.8%)	4(20%)	1(7.7%)	
· Normal	15(88.2%)	10(50%)	4(30.8%)	
Mortality				
· <30%	0(0%)	9(45%)	9(69.2%)	0.001
· 30-42%	4(23.5%)	5(25%)	1(7.7%)	
· >42%	13(76.5%)	6(30%)	3(23.1%)	
Progressive motility				
· <20%	1(5.9%)	10(50%)	10(76.9%)	0.002
· 20-30%	3(17.6%)	3(15%)	0(0%)	
· >30%	13(76.5%)	7(35%)	3(23.1%)	
Morphology				
· <4%	4(23.5%)	16(80%)	10(79.9%)	0.001
· ≥4%	13(76.5%)	4(20%)	3(23.1%)	

Table 7: The association between semen analysis parameters and snuffing duration of patents in snuffer group

	OR	CI95%	P
Low count (oligiospermia and azoospermia)			
· Snuffing duration (<10 yrs)	1	–	–
· Snuffing duration (10-20 yrs)	2.3	0.52-9.7	0.279
· Snuffing duration (>20yrs)	16.8	2.6-46.3	0.003
Motility (<42%)			
· Snuffing duration (<10 yrs)	1	–	–
· Snuffing duration (10-20 yrs)	1.4	0.29-7.1	0.663
· Snuffing duration (>20yrs)	11.0	2.0-60.0	0.006
Progressive motility (<30%)			
· Snuffing duration (<10 yrs)	1	–	–
· Snuffing duration (10-20 yrs)	1.8	0.37-8.7	0.533
· Snuffing duration (>20yrs)	10.8	1.9-59.8	0.007
Morphology (<4%)			
· Snuffing duration (<10 yrs)	1	–	–
· Snuffing duration (10-20 yrs)	0.83	0.15-4.5	0.844
· Snuffing duration (>20yrs)	10.6	2.1-60.0	0.007

Table 8: The logistic regression show comparison between semen parameters and snuffing duration in snuffers group

	Snuffing frequency/day			P
	<10	10-20	>20	
Count				
· Azoospermia	0(0%)	0(0%)	6(22.2%)	0.010
· Severe oligiospermia	0(0%)	0(0%)	8(29.6%)	
· Oligiospermia	3(17.6%)	1(16.7%)	3(11.1%)	
· Normal	14(82.4%)	5(83.3%)	10(37%)	
Mortality				
· <30%	1(5.9%)	1(16.7%)	16(59.3%)	0.005
· 30-42%	6(35.3%)	1(16.7%)	3(11.1%)	
· >42%	10(58.8%)	4(66.7%)	8(29.6%)	
Progressive motility				
· <20%	2(11.8%)	2(33.3%)	17(63%)	0.004
· 20-30%	5(29.4%)	0(0%)	1(3.7%)	
· >30%	10(58.8%)	4(66.7%)	9(33.3%)	
Morphology				
· <4%	7(41.2%)	3(50%)	20(74.1%)	0.083
· ≥4%	10(58.8%)	3(50%)	7(25.9%)	

Table 9: The association between semen analysis parameters and snuffing frequency of patents in snuffer group

	OR	CI95%	P
Low count (oligiospermia and azoospermia)			
· Snuffing frequency (<10/day)	1	–	–
· Snuffing frequency (10-20/day)	1.5	0.86-8.3	0.068
· Snuffing frequency (>20/day)	7.9	1.8-34.5	0.008
Motility (<42%)			
· Snuffing frequency (<10/day)	1	–	–
· Snuffing frequency (10-20/day)	1.3	0.72-7.3	0.106
· Snuffing frequency (>20/day)	3.4	1.7-12.1	0.041
Progressive motility (<30%)			
· Snuffing frequency (<10/day)	1	–	–
· Snuffing frequency (10-20/day)	1.8	0.82-10	0.148
· Snuffing frequency (>20/day)	4.1	1.1-14.9	0.033

Table 10: The logistic regression show comparison between semen parameters and snuffing frequency in snuffers group

Table 9 & 10 showed that, the snuffing frequency above 20 times/day was significant risk factor of low count (oligiospermia and azoospermia) (OR= 7.9; 95%CI: 1.8-34.5; P= 0.008), low motility <42% (OR= 3.4; 95%CI: 1.7-12.1; P= 0.041), low progressive motility <30% (OR= 4.1; 95%CI: 1.1-14.9; P= 0.033) but not normal morphs <4% (P= 0.083)

4. Discussion

When a clinical pregnancy cannot be achieved after 12 months or more of frequent, unprotected sexual activity, the condition is known as infertility, according to the World Health Organization. An important factor in cases of infertility is male infertility. Routine semen testing is still the primary indicator of male fertility assessment, even after controlling for general physical condition, heredity, hormones, and concomitant diseases. Research has looked at how smoking or chewing tobacco affects the quality of human seminal fluid. Research has looked at how tobacco use—smoking or not—affects the quality of human seminal fluids, and it's likely that nicotine has a negative impact on the health of male reproductive systems. The impact of toombak snuffing on seminal parameters is being investigated for the first time in this study [11] .

In the present study, most snuffers (42%) belonged to the third decade of the age group (30–39 years). In the study of Idris et al., Among teenagers, young adults, and people over 60, the average rate of usage is 34%, 32%, and 47%, respectively. (5). Among patients in the snuffer group, the majority of them had snuffing durations ranging from 10 to 20 years (40%) and had snuffing frequency >20 times per day (54%). Similarly, in the study, Naresh et al. found that the majority of the cases (66%) were severe users (>10 times a day) [12].

In general, 80.8% of the patients in our research were married. Moreover, primary infertility accounted for 45.8% of the diagnoses for the majority of our patients, and this reflects the global rise of the infertility problem, According to estimates from the World Health Organization, between 60 and 80 million couples globally are infertile at present. Correspondingly, Bhavna et al. reported that most of the cases were diagnosed with primary infertility [13]. Also, Benksim et al. 32.63% and 67.37 percent, respectively, were reported as the rates of both primary and secondary infertility in Morocco [14].

This study demonstrated that azoospermia and oligiospermia were significantly higher among the patients in snuffer groups than those in non-snuffer groups (42% vs. 15.8%; P = 0.005). Moreover, snuffing was a significant predictor of low count (oligiospermia and azoospermia) (OR = 3.8; 95% CI: 1.6–9.1; P = 0.002). This could be attributed to the effects of nicotine in toombak. Studies on animals suggested that nicotine would have a concentration-dependent influence on the spermatogenesis, endocrine hormone levels, litter size, and male reproductive organ function, ultimately leading to fecundity [15]. Due to its documented ability to impair testicular microcirculation, nicotine has been shown to disrupt the hypothalamus-pituitary axis [16]. Reduced sperm counts may result from a fall in testosterone levels, which can be caused by a disruption in the androgen/oestrogen ratio or by altered Leydig cell activity. Testosterone works on seminiferous tubules to begin and sustain spermatogenesis [15], [17], [18]. Our findings were in accordance with Agnes et al., They discovered that the total sperm count in 109 snuff users was 24% lower (P = 0.03) than in non-users [6], Priyadarsini et al., who discovered that chewing tobacco is a risk factor for low sperm count (odds ratio (OR) = 2.2; 95% confidence interval (CI): 1.5–3.99) [19], Bhavna et al. [13], who discovered that cases of azoospermia and oligospermia were significantly higher in infertile patients who chewed tobacco than in non-users (P<0.05), and Pärn et al. [20], who discovered that men who snuff had lower sperm counts than those who did not (P<0.05. Also, the studies of Padia et al. [21] and chewing tobacco was substantially (P<0.05) linked to poor sperm count, according to Naresh et al. [12]. However, there was no discernible change in sperm counts between tobacco users and nonusers according to Richthoff et al. and Dikshit et al. [22], [23].

In this study, low motility (both total motility and progressive motility) was significantly greater among the patients in snuffer groups than those in non-snuffer groups (total motility = 56% vs. 25.7%; P = 0.003, progressive motility = 56% vs. 25.7%; P = 0.003). Additionally, poor progressive

motility <30% (OR = 2.0; 95% CI: 1.3–4.2; P = 0.018) and low overall motility <42% (OR = 3.6; 95% CI: 1.7–7.9; P = 0.001) were significantly predicted by snuffing. Nicotine, as demonstrated by in vitro experiments, dramatically reduced sperm motility at a dose of 1 mM and sperm kinematics at a concentration of 70 ng/ml. (19, 24). Tobacco products containing nicotine and other substances likely reduce sperm motility by causing harm to the mitochondrial genome, enzymatic activity, or seminal vesicle function. (19). Our results were in agreement with Priyadarsini et al., who found tobacco chewing is a risk factor for low motility (OR = 3.2; 95% CI: 2.05–4.9) (19), According to Bhavna et al. [13], chewing tobacco was associated with a considerably greater case of asthenozoospermia (P<0.05) than non-chewing tobacco. Chewing tobacco was shown to be substantially linked (P<0.05) with impaired progressive motility [21], Researchers Naresh et al. discovered a statistically significant reduction in sperm motility (P<0.05) in tobacco chewers compared to the control group [12], while Pärn et al. found that males who used snuff had poorer motility and sperm counts than those who did not use it [20]. Despite the fact that studies by Richthoff et al. and Dikshit et al. did not find a statistically significant difference in sperm motility between tobacco users and nonusers [22], [23].

The current study represented that the rate of low normal morphs <4% was significantly higher among the patients in snuffer groups than those in non-snuffer groups (60% vs. 35.8%; P = 0.014). Furthermore, snuffing was a significant predictor for low normal morphs <4% (OR = 2.7; 95% CI: 1.2–5.7; P = 0.009). According to predictions, certain nicotines may lead to aberrant Golgi body growth in the proacrosome and inappropriate nucleus attachment, resulting in a faulty sperm head with an irregular or nonexistent acrosome, and therefore teratozoospermia [13]. Tobacco chewing has been consistently linked to low normal morphology (OR = 8.4; 95% CI: 4.9–14.6), according to Priyadarsini et al. [19], and Bhavna et al. The number of instances of teratozoospermia in tobacco-chewing patients was substantially greater than in the other groups (P<0.05) [13].

Interestingly, this study demonstrated that the longer snuffing duration above 20 years was a significant risk factor for low count (oligiospermia and azoospermia) (OR= 16.8; 95%CI: 2.6-46.3; P= 0.003), low motility <42% (OR= 11.0; 95%CI: 2.0-60.0; P= 0.006), low progressive motility <30% (OR= 10.8; 95%CI: 1.9-59.8; P= 0.007), and normal morphs <4% (OR= 10.6; 95%CI: 2.1-60.0; P= 0.007). These observations were supported by Naresh et al., They discovered that the longer the tobacco chewing period, the more gradually the sperm count and liquefaction time decreased (P<0.05) [12].

Remarkably, our study illustrated that intensive snuffing use above 20 times per day was a significant risk factor for low count (oligiospermia and azoospermia) (OR = 7.9; 95% CI: 1.8–34.5; P = 0.008), low motility <42% (OR = 3.4; 95% CI: 1.7–12.1; P = 0.041), low progressive motility <30% (OR = 4.1; 95% CI: 1.1–14.9; P = 0.033), but not normal morphs <4% (P = 0.083). These findings were confirmed by numerous studies, such as Agnes et al. [6], Tamer et al. [8], and Priyadarsini et al. [19]. Significant differences were seen in sperm quantity, morphology, viability percentage, and percentage motility among the patients who reported utilizing at least ten packets each day.

5. Conclusion

Spermatogenesis has been significantly hampered by toombak snuffing, which in turn has an impact on sperm motility, count, and morphology. Furthermore, longer duration (>20 years) and intensive toombak snuffing use (>20 time per day) were significantly correlated with low sperm count, motility and morphology. Enhance community awareness regarding the detrimental consequences of toombak snuffing is recommended. Men who use toombak snuff at infertility clinics have to be advised about the potential harm their behavior may do to the quality of their sperm. There is a necessity for additional prospective multicenter studies to investigate treatment outcomes among individuals with a history of toombak snuffing in our population.

Conflict of interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

Authors Contribution

All authors contributed equally in this paper.

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