Psychological Motives and Vulnerability for Pulmonary Dysfunction among Tobacco Smokers

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Abstract: Background: Tobacco smoking has multidimensional motives which might lead to compulsive or problematic nicotine use. Pulmonary diseases associated with tobacco smoking are a complex group of disorders the early diagnosis of which as well as identification of motives behind smoking would allow effective management. Therefore, the aim of the present study was to assess motives that influence smokers' decision to use tobacco, the impact on pulmonary function and possible associations among those outcomes as well as with related background characteristics of study participants. METHODS: Participants in this descriptive correlational study comprised of 96 smokers. Majority was students, with average age of 22.01±5.87 years. Age, weight, height, BMI and pack-years were recorded, smoking dependence motives were assessed and spirometry was performed. RESULTS: Smoking dependence motives revealed equivocal mean ranged between (2.5 – 2.8) with increasing mean value of nicotine dependence motives. Mean tobacco consumption was 9.80 ± 10.82 pack-years. Study participants exhibited mild airflow limitation, mean percentage of predicted values for FEV1 was 83% ± 0.9, mean FVC was 4.6 ± 1.3, and FEV1/FVC ratio was as low as 45% ± 1.2. Psychological motives had shown weak correlations with FEV1, FVC and PEF. Certain motives however, showed significant differences with number of cigarettes smoked per day. Age at start of smoking as well as intensity of smoking showed significant relation with FEV1 decline. CONCLUSIONS: Smokers had shown mild airflow limitation. Various smoking motives affected study participants equally. The implementation of a coordinated tobacco control program is therefore required.

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1. Introduction

Cigarette smoking is a serious health problem and most important avoidable causes of death worldwide (Pasupathi, Bakthavathsalam, Rao & Farook, 2009), contributing to a large number of diseases (Tashkin & Murray, 2009). Currently, approximately 1.3 billion people smoke worldwide and consequently 5.4 million people die from tobacco use each year (Feng *et al.*, 2010). Though tobacco use is steadily declining in developed countries, smoking prevalence and cigarette consumption are increasing in developing countries (Ezzati & Lopez, 2003). Almost all the large Arab countries (Egypt, Jordan, and Yemen) have very high adult male smoking prevalence rates. Current data from Jordan and other Arab developing countries reveal a high recent prevalence of smoking among university students that varies between 28.6% (Haddad & Petro-Nustas, 2006) and 35.0% (Khader & Alsadi, 2008). This could be due to the lack of proper educational programmes and the lack of effective measures for controlling the problem (Bener & Al-Ketbi, 1999).

Tobacco smoking is a more increasing trend expected to occur among university students and this could be related to alleviation of stress, life problems, peer pressure, social acceptance, family history of smoking, lower educational level of parents and the desire to attain high personality profile (Kegler, 1999). In contrast, religion, negative health effects, bad taste and smell, adverse physiological responses and issues related to family are considered good reasons for not smoking (Felimban & Jarallah, 1994; Kegler, 1999). The medico-psychiatric tradition in tobacco dependence is exemplified by diagnostic criteria for tobacco dependence employed in recent editions of the Diagnostic and Statistical Manuals (DSMs; American Psychiatric Association, 1994). In this tradition, dependence is essentially a binary variable – one is either dependent on nicotine or not. The presence of dependence is measured by the display of various diagnostic criteria or features of the prototypic dependence syndrome, as determined by expert consensus (e.g., compulsive use of tobacco, craving or withdrawal symptoms contingent on abstinence) (Piper *et al.*, 2004). Traditionally, nicotine dependence (ND) has been characterized by the development of tolerance with regular use and the emergence of withdrawal symptoms as a function of abstention/reduction. This construct has important implications for understanding the long-term use of tobacco, as well as the difficulty in achieving and maintaining abstinence when attempting to quit (Jennie, Ming & Thomas, 2012).

According to previous theory and research, ~~a~~nxiety provoking situation is an important and unique cognitive factor for better understanding clinically-relevant psychological processes related to cigarette smoking. Gonzalez, Zvolensky, Vujanovic, Leyro and Marshall (2009) reported that anxiety was significantly related to coping, addictive and habitual smoking motives, as well as greater perceived barriers to quitting. On the same line, Gregor, Zvolensky, Bernstein, Marshall and Yartz (2007) showed that the motivation to smoke to reduce negative affect was significantly related to anxiety sensitivity and negative affectivity, but not anxious arousal; the observed significant effects were above and beyond other theoretically relevant factors (e.g., smoking rate, years smoked, age, gender). Moreover, Peasley-Miklus, McLeish, Schmidt and Zvolensky (2012) examined the relationship between chronic, excessive worry and important smoking-related processes had an influence in smoking behavior, such as smoking outcome expectancies and motives. Zvolensky *et al.* (2006) reported that daily smokers with higher relative to lower levels of physical and mental incapacitation concerns are more apt to be motivated to smoke to relieve negative emotional distress and have little confidence in abstaining when in a negative mood state.

Accordingly and based on those extensive research reports, it seemed that tobacco smokers have variety of physical, and psychosocial motives for continuing smoking regardless of its adverse effects on their physical health.

Among the major health risks associated with tobacco smoking are a complex group of disorders, ranging from chronic obstructive pulmonary disease (COPD) to lung cancer (Rao, Goodman & Tomashefski, 2008; Papaioannou, Loukides, Gourgoulianis & Kostikas, 2009; Pasupathi *et al.*, 2009; Boskabady, Mahmoodinia, Boskabady & Heydari, 2011). These conditions cause progressive and irreversible lung damage. Chronic obstructive pulmonary disease (COPD) has therefore been considered as a major cause of chronic morbidity throughout the world and is predicted to become the third leading cause of deaths worldwide by the year 2020 (Tashkin & Murray, 2009).

Chronic obstructive pulmonary disease is a common disease, the early diagnosis of which would allow effective management and treatment. Clotet, Gómez-Arbonés, Ciria and Albalad (2004); Kotz, Wesseling, Aveyard and van Schayck (2011) reported that spirometric screening of smokers can identify those most susceptible to developing COPD while the disease is in an early phase. Early detection of functional impairment and its appropriate treatment will help to reduce morbidity and mortality due to these diseases (Prajapati *et al.*, 2010).

Pulmonary function test (PFT), is a relatively simple, non invasive test, used to detect air flow limitation and/or lung volume restriction (Prajapati *et al.*, 2010). Spirometry is the most widely used pulmonary function test that measures the volume of air expelled from fully inflated lungs as a function of time. Measurement of forced vital capacity (FVC), forced expiratory volume in 1 second (FEV1) and peak expiratory flow (PEF) is critical for assessing prevalence of chronic obstructive pulmonary disease (COPD) and asthma among smokers (Adedoyin, Erhabor, Olajide & Anifowose, 2010). FEV1 is the volume of air that is forcibly exhaled in the first second, FVC is the total volume of air exhaled after a full inspiration, whereas peak expiratory flow (PEF) is the maximal flow that a person can exhale during a short maximal expiratory effort after complete inspiration (Barreiro, & Perillo, 2004; Ranu, Wilde & Madden, 2011).

COPD is known as a disease which is frequently under-diagnosed (Medbø & Melbye, 2007). Airflow obstruction can be diagnosed using spirometry alone by demonstrating a low FEV1/FVC ratio (Maestú & de Pedro, 2012). Tashkin and Murray (2009) also emphasized that since COPD is defined mainly on the basis of its abnormal physiology, spirometry would be essential for diagnosis by demonstrating fixed airflow obstruction, i.e., a ratio of forced expired volume in 1 s (FEV1) to forced vital capacity (FVC) of <70%. Moreover, the value of FEV1 is very essential in quantifying airflow limitation (Kavitha, Sujatha, & Ramakrishnan, 2010). GOLD staging of the severity of COPD is also based on spirometry: mild, moderate, severe and very severe diseases are defined by FEV1 values of >80%, 50-79%, 30-49% and <30%, respectively (Tashkin & Murray, 2009; Maestú & de Pedro, 2012).

Previous research studies had demonstrated some decline in pulmonary function parameters associated with smoking behavior (Clotet *et al.*, 2004, Bano, Ahmad, Mahagaonkar & Latti, 2011). In a recent study, done by Nighute and Awari (2011), it has been found that smoking exerted a deleterious effect on almost all of the pulmonary function parameters leading to significant impairment. In this study, 36.0% of the study sample had obstructive changes which were the most common, followed by the restrictive (8.0%) and the mixed (4.0 %) changes. Most of the previous research reports however were done on elderly age groups, while very scarce studies had been done on young adult smokers among whom the smoking prevalence was reported as being high.

Significance of the Study

Despite the well-publicized dangers of smoking, the prevalence rates remain big because once an individual smokes regularly it is unlikely that he or she will be able to quit easily. Considerable number of research examined smoking behaviour among smokers as compared to non smokers but very limited research describing the psychological motives behind smoking and the vulnerability to pulmonary dysfunctions especially among the university community including those young smokers from students and other staff members. Thus it may be promising for future research to examine the relations among smoking motives and smoking related pulmonary health risks to help direct future intervention to control the high smoking prevalence. Therefore, the aims of the current study were to:

1. Assess the psychological motives behind tobacco smoking.
2. Assess the impact smoking has on pulmonary function among study participants
3. Investigate the possible associations between psychological motives, pulmonary dysfunction and other related background characteristics among study participants

2. Participants and Methods

Design:

A descriptive correlational design was utilized to achieve the aim of the current study.

Setting and Participants:

This study was carried out at Zarqa Private University in Jordan. The study sample consisted of 96 participants attending the university including students, academic and administrative staff working in the university. Inclusion criteria were, continuous daily smoking for at least one year and readiness to volunteer.

Measurements:

In order to achieve the aim of the current study, the following three instruments were used:

Instrument I.

This instrument developed by the researchers and covered the background characteristics of study participants that included: age, type of work, anthropometric measures (height, weight, BMI), age at start of smoking, duration of smoking and number of cigarettes smoked per day.

Instrument II:

The Wisconsin Inventory of Smoking Dependence Motives (WISDM-68) is theoretically derived measure of tobacco dependence comprised of 68 items within 13 subscales designed to measure multidimensional motivational influences that drive tobacco use (Piper *et al.,* 2004; Piper *et al.,* 2008). These are: affiliative attachment, automaticity, loss of control, behavioral choice/melioration, cognitive enhancement, craving, cue exposure/associative processes, negative reinforcement, positive reinforcement, social/environmental goads, taste/sensory properties, tolerance, and weight control subscales. Each item is answered on a 7-point likert scale ranging from 1 – "not true of me at all" to 7 – "extremely true of me." The WISDM-68 subscales have demonstrated good psychometric characteristics (Piper *et al.,* 2008; Shenassa, Graham, Burdzovic & Buka, 2009) and have the potential to elucidate diverse nicotine dependence factors and mechanisms (Piper *et al.,* 2004; Piper *et al.,* 2008). The reported internal reliability for WISDM-68 subscales was fair to excellent (alpha ranged from 0.73 to 0.95) as shown by Piper *et al.* (2004). Moreover to ensure the content validity, the translated Arabic version of the questionnaire was evaluated by a panel of experts who were selected based on their qualifications and experience in nursing research and education from Zarqaa University.

The instrument was pilot tested to identify ambiguities in questions, times required for completing the questionnaire, and any difficulties that might be encountered by the participants in reading or understanding the questionnaire. 10 participants from the University participated in the pilot study and were excluded from the actual study. The results of the pilot study showed that the questionnaire was clear, easy to read, and required around 20 minutes to be completed. The internal consistency reliability of the instrument and coefficients were computed. The reliability coefficient of the questionnaire was 0.70.

Instrument III (Spirometry).

This elicited the data pertaining to Pulmonary Function Test indices which was done using a computerized spirometer (RMS-Med Spirometer). These indices included:

- **FEV1:** Forced expiratory volume after one second (L)
- **FEV :** Forced expiratory flow (L/s)
- **PEF :** Peak expiratory flow (L/s)
- **FEV1/FVC:** The ratio of FEV1 to FVC.

The information these devices provide is objective, precise, reproducible, and reliable for evaluating all types of pulmonary disease and as a screening for the presence of disease in persons with risk factors, such as smoking (Maestú & de Pedro, 2012).

Ethical Consideration

Official permission to conduct the study in Zarqa University was obtained from the University administration. Ethical codes were addressed and had been assured. The researchers explained the purpose of the research to all participants. Participants were asked for their permission to attend for pulmonary function tests according to the nominated schedule. The assurance of anonymity was addressed prior to request for participation. Data collection methods were designed to protect the confidentiality of the information obtained by assigning a code number to all data collection methods. Furthermore, participants were assured that their participation in the study was voluntarily and that they could withdraw at any time.

Finally, an informed consent was required from each participant.

Data Collection Procedure

After receiving the consent forms from the participant and prior to questionnaire administration and the test performance, participants were given instructions on how to fill out the questionnaire completely and truthfully. After filling out the questionnaire, anthropometric measurements, such as weight, height and body mass index (BMI) were taken; according to guidelines stated by the National Institutes of Health, weight status was classified into four categories: underweight (BMI <18.5), normal weight (BMI between 18.5 – 24.9), overweight (BMI between (25- 29.9), and obese (BMI >30).

These measurements were done in the morning (at least three hours after waking up) when participants were on an empty bladder, not having exercise, food or drink for at least the three previous hours. Subjects were instructed to wipe off the bottom of their feet before stepping onto the measuring platform, since unclean foot pads may interfere with conductivity. Height measurements were taken with a secured metal ruler.

Pulmonary function tests of smokers were measured using a spirometer. Prior to pulmonary function testing, the required manoeuver was demonstrated each of participants, and they were encouraged and supervised throughout the test performance. After rest for 5–10 min and briefing to the technique of PFT, the test was carried out in a private and quiet room, between 9 to 12 a.m. to rule out any diurnal variation with subjects in sitting posture wearing nose clips. The participants were seated during spirometry testing. The American Thoracic Society-criteria for Spirometry testing were followed.

The participants performed the lung function manoeuvres at least three times in order to obtain a minimum of two acceptable and reproducible values (Ranu, Wilde & Madden, 2011). The best results for forced vital capacity (FVC) and FEV1 were selected as the recording. The ratio of FEV1 to FVC (expressed as a percentage) was calculated from the largest FEV1 and FVCT.

Statistical Analysis

Data analysis was carried out using the SPSS statistical package version 18. The obtained data were coded, analyzed and tabulated. Descriptive and nonparametric statistical analysis was carried out accordingly. Inferential statistics included the Person product moment correlation for assessing associations among study outcome measures; as well as one-way analysis of variance for assessing the relation of study participants' background characteristics and the study measured outcomes.

3. Results

Table 1 shows baseline characteristics of the study group. The study group consisted of 97 participants. Majority was students, age less than 30 (89 participants) with average age of 22.01±5.87 years. There were 94 males and only three females. Thirty-five participants started to smoke at an age as young as eight to 15 years; sixty-eight had smoked at age of sixteen to twenty three years, while only four participants had smoked at age later after twenty three years of age. Mean calculated duration for cigarette smoking was 5.53 ± 4.8 years. Majority of participants identified that they smoke more than 21 cigarettes a day (83 participants) with the biggest group smoked between 21 to 30 cigarettes a day (50 out of the 83 participants).

The quantification of tobacco smoking (average pack years) was done by calculating the smoking index which is equal to multiplication of the average number of cigarettes is smoked per day and duration (in years) of tobacco smoking. Average pack years of smoking for study participants was 9.80 ± 10.82. Analysis of biometric characteristics of study participants showed a healthy weight range. Participants had a mean of 179.4 cm for height, 76 kg for weight with a mean BMI of 23.6.

Concerning pulmonary function indices, study participants exhibited mild airflow limitation. Study participants had FEV1 in the lowest limits of normality. Mean percentage of predicted values for forced expiratory volume in 1 second (FEV1) was 83% ± 0.9. Mean forced vital capacity (FVC) was 4.6 ± 1.3 while the ratio of FEV1/FVC was as low as 45% ± 1.2, indicating mild obstruction combined with restriction. Mean peak expiratory flow was as low as 2.1 ±1.0, coinciding with the low FEV1.

Further, descriptive analysis of Wisconsin Inventory for smoking dependence motives revealed very close mean values for the different subscales of smoking motives with mean range between 2.5 – 2.8, as shown in table 2.

Associations between WISDM – 68 subscales, measures of pulmonary function, participants' age as well as BMI were tested using a Pearson product moment analysis. As revealed, participants' age was significantly associated only with BMI (r= 0.27).

In addition, both WISDM-68 subscales and pulmonary function indices were highly correlated among themselves only. The correlation coefficients for the spirometry measured values were FEV1 vs. FVC = (r= 0.22); FEV1 vs. PEF = (r= 0.60); and FVC vs. PEF = (r= 0.30). Psychological motives had shown weak correlations with FEV1, FVC and PEF. Most of these associations were negative but none was statistically significant as presented in table 3.

ANOVA was used for testing the relationship between participants' background characteristics with the psychological motives for smoking. Psychological motives for smoking did not differ significantly with different age, occupation, or age at start of smoking. However, significant differences were found between number of cigarettes smoked per day and some psychological motives. As shown, participants who smoke 31 cigarettes and more scored the highest on the following motives: cue exposure/associative process, behavioural choice/melioration, positive reinforcement, and weight control as presented in table 4.

Further, analysis of variance was used to determine whether or not there was a difference in lung function among the participants in the different background variables. As shown, some variations were observed in the lung functions (actual and observed values) among different age categories and the three occupational groups but none was significant.

One-way analysis of variance showed that participants who started smoking after age of 23 had significantly higher scores for most of the lung function indices compared with those who started smoking at lower ages: FEV1 (F= 4.04; P < 0.02); PEF (F= 4.70; P < 0.01).

Moreover, significant differences were also found between certain lung function indices and number of cigarette smoked per day. Participants who smoked 10 cigarettes or less a day had higher FEV1 compared with those who are smoking more: FEV1 (F= 3.16; P < 0.018). However, no significant difference existed between FVC and PEF among participants in the different cigarette smoking categories as presented in table 5.

Table 1: Characteristics of Study Sample (N=97)

Variable	N	%
Gender:		
Male	94	96.91
Female	3	3.09
Occupation:		
Students	62	63.92
Staff	25	25.77
Teacher	10	10.31
Age:		
20 or less	35	36.08
21-30	54	55.67
31-40	6	6.19
More than 40	2	2.06
Number of Cigarettes per Day:		
10 or Less	3	3.09
11-20	11	11.34
21-30	50	51.55
31-40	23	23.71
More than 40	10	10.31
Age Start Smoking:		
8-15	25	25.77
16-23	68	70.10
More than 23	4	4.12
	Range	**Mean (SD)**
Pack Years of Cigarette (Years)	1-85	9.804
Height	156-195	179.4 (7.6)
Weight	50-135	76.0 (14.3)
BMI	16.7-40.3	23.6 (4.0)

Table 2: Mean Distribution of Smoking Dependence Motives and Pulmonary Functions and among Study Sample.

Parameter	Mean (SD)
Pulmonary Function Indices:	
FEV1 (L)	1.7(0.8)
FEV1 - % predicted	83%(0.9)
FVC (L)	4.6(1.3)
FEV1/FVC ratio*100	45%(1.2)
PEF rate (L/s)	2.1(1.0)
Smoking Dependence Motives:	
Craving	2.8(0.9)
Automaticity	2.6(0.9)
Cue Exposure/Associative Process	2.8(0.8)
Taste/Sensory Process	2.6(0.9)
Tolerance	2.8(1.1)
Affiliative Attachment	2.8(1.1)
Behavioral Choice/Melioration	2.7(0.8)
Cognitive Enhancement	2.7(0.9)
Positive Reinforcement	2.5(0.9)
Weight Control	2.6(0.8)
Social/Environmental Goads	2.8(0.8)
Negative Reinforcement	2.7(0.8)
Loss of Control	2.5(0.9)
Total	2.7(0.7)

FEV1, forced expiratory volume in 1 second; FVC, forced vital capacity; PEF, peak expiratory flow

Table 3: Pearson-Product-Moment Correlation among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1)Age	1.00	0.27**	-0.07	-0.05	-0.04	-0.04	-0.16	0.003	-0.03	-0.08	-0.11	-0.098	-0.10	-0.17	-0.01	-0.06	-0.04	0.05
2)BMI		1.00	-0.07	-0.07	-0.04	0.04	-0.04	0.20	0.16	0.09	-0.01	-0.01	0.001	0.04	0.13	-0.08	-0.05	-0.05
3)Craving			1.00	0.43**	0.59**	0.63**	0.54**	0.62**	0.60**	0.52**	0.55**	0.46**	0.49**	0.54**	0.60**	0.06	-0.08	0.01
4)Automaticity				1.00	0.67**	0.59**	0.44**	0.44**	0.50**	0.57**	0.58**	0.45**	0.34**	0.56**	0.45**	0.08	-0.01	-0.14
5)Cue Exposure/Associative Process					1.00	0.69**	0.63**	0.62**	0.59**	0.63**	0.72**	0.57**	0.54**	0.69**	0.61**	0.05	-0.10	-0.02
6)Taste/Sensory Processes						1.00	0.53**	0.67**	0.64**	0.68**	0.72**	0.55**	0.41**	0.72**	0.65**	0.021	0.01	-0.01
7)Tolerance							1.00	0.64**	0.61**	0.51**	0.55**	0.58**	0.51**	0.57**	0.69**	0.105	-0.03	0.02
8)Affiliative Attachment								1.00	0.75**	0.52**	0.62**	0.55**	0.47**	0.58**	0.73**	0.013	-0.03	-0.02
9)Behavioral Choice/ Melioration									1.00	0.54**	0.65**	0.57**	0.46**	0.50**	0.65**	0.013	-0.039	-0.049
10)Cognitive Enhancement										1.00	0.63**	0.39**	0.40**	0.76**	0.59**	-0.06	-0.08	-0.09
11)Positive Reinforcement											1.00	0.49**	0.43**	0.71**	0.62**	-0.05	0.008	-0.014
12)Weight Control												1.00	0.33**	0.44**	0.52**	0.14	-0.027	-0.008
13)Social /Environmental Goads													1.00	0.51**	0.41**	0.071	-0.103	-0.053
14)Negative Reinforcement														1.00	0.59**	-0.037	-0.051	0.005
15) Loss of Control															1.00	0.10	-0.02	-0.03
16)FEV1																1.00	0.22*	0.60**
17)FVC																	1.00	0.30**
18)PEF																		1.00

* Correlation significant at 0.05; ** correlation significant at 0.01 level , *** correlation significant at 0.01 level (Pearson, two-tailed).

Table 4: *F*-test for Smoking Dependence Motives by Age, Occupation, Smoking Duration and Number of Cigarette Smoking Per Day.

	Craving	Automat.	Cue Exp./ Assoc Pro	Taste/ Sensory Processes	Tolerance	Affiliative Attach.	Behav. Choice/ Meliorat.	Cognitive Enhanceme nt	Positive Reinforc.	Weight Control	Negative Reinforc.	Social /Environ. Goads	Loss of Control
Age Category													
Less than 20 (N=35)	2.8(1.2)	2.6(1.1)	2.6(0.9)	2.5(0.9)	2.9(1.3)	2.8(1.2)	2.6(0.9)	2.6(1.1)	2.5(1.1)	2.5(1.1)	2.8(1.1)	3.1(1.1)	2.7(1.2)
21-30 (N=54)	2.8(0.8)	2.7(0.8)	2.9(0.8)	2.6(0.8)	2.8(0.9)	2.8(0.9)	2.7(0.8)	2.8(0.8)	2.6(0.9)	2.6(0.9)	2.7(0.8)	2.9(0.9)	2.8(1.0)
31-40 (N=6)	3.0(1.2)	2.7 (0.4)	2.8(0.9)	2.9(0.7)	2.8(1.0)	3.5(0.8)	3.1(0.6)	2.6(0.7)	2.4(0.8)	2.4(0.5)	2.5(0.3)	2.9(0.9)	3.3(0.7)
More than 40 (N=2)	1.8(0.4)	1.6(0.6)	250(1.7)	1.4(0.6)	2.3(1.6)	1.3(0.4)	1.7(1.0)	1.5(0.7)	1.6(0.8)	1.5(0.7)	1.4(0.4)	3.3(1.8)	1.6(0.5)
F(*p*-value)	0.9(0.5)	1.1(0.4)	0.6(0.6)	1.8(0.2)	0.2(0.9)	2.4(0.1)	1.7(0.2)	1.3(0.3)	0.8(0.5)	0.8(0.5)	1.5(0.2)	0.4(0.8)	1.4(0.3)
Occupation													
Student (N=62)	2.8(1.1)	2.6(0.9)	2.7(0.9)	2.5(0.9)	2.9(1.1)	2.8(1.1)	2.63(0.9)	2.7(1.03)	2.57(1.0)	2.4(1.0)	2.8(1.0)	2.9(1.0)	2.8(1.1)
Staff (N=25)	3.0(0.7)	2.7(0.9)	2.9(0.76)	2.8(0.8)	2.6(0.9)	2.8(0.9)	2.74(0.8)	2.7(0.7)	2.63(0.8)	2.8(0.9)	2.6(0.8)	2.9(0.9)	2.7(0.9)
Teacher (N=10)	2.4(1.1)	2.7(0.7)	2.72(1.0)	2.4(0.9)	2.6(1.0)	2.9(1.2)	2.5(0.8)	2.4(0.7)	2.0(0.8)	2.2(0.6)	2.2(0.5)	2.9(1.1)	2.7(0.9)
F(*p*-value)	1.6(0.2)	0.1(0.9)	0.3(0.7)	0.7(0.5)	1.2(0.3)	0.1(0.9)	0.2(0.8)	0.5(0.6)	1.8(0.2)	2.4(0.1)	2.2(0.1)	0.1(0.9)	0.0(1.0)
Age Start Smoking													
8-15 (N=25)	2.9(0.9)	2.9(1.0)	2.9(0.9)	2.6(0.9)	3.0(1.0)	3.2(1.0)	2.9(0.9)	2. 8(0.9)	2.6(1.0)	2.5(0.9)	2.9(1.0)	3.3(1.0)	2.9(1.1)
16-23 (N=68)	2.8(1.0)	2.5(0.8)	2.8(0.9)	2.6(0.8)	2.9(1.1)	2.7(1.0)	2.6(0.8)	2.6 (0.9)	2.5(0.9)	2.6(0.9)	2.7(0.9)	2.8(1.0)	2.8(1.1)
More than 23 (N=4)	2.4(1.3)	2.2(0.7)	2.1(0.6)	2.1(1.0)	2.0(0.7)	3.0(1.4)	2.5(1.3)	2.0(1.0)	2.2(1.2)	1.8(0.7)	2.1(0.7)	2.7(0.6)	2.3(0.9)
F(*p*-value)	0.4(0.7)	2.0(0.1)	1.5(0.2)	0.7(0.5)	1.6(0.2)	1.9(0.2)	1.2(0.3)	1.0(0.3)	0.2(0.8)	1.3(0.3)	1.2(0.3)	1.9(0.2)	0.4(0.7)
Number of Cigarette													
Less than 10 (N=3)	3.4(0.1)	2.5(0.3)	2.9(1.0)	3.0(0.6)	2.9(0.9)	3.1(0.7)	3.0(0.6)	2.1(0.3)	3.0(0.4)	2.7(0.5)	2.7(0.7)	3.1(0.8)	3.7(0.3)
11-20 (N=11)	2.7(1.1)	2.4(0.6)	2.7(0.3)	2.2(0.7)	2.8(0.5)	2.7(0.8)	2.6(0.7)	3.0(0.9)	2.4(0.7)	2.3(0.8)	2.8(0.8)	2.6(0.6)	2.6(0.7)
21-30 (N=50)	2.7(0.9)	2.5(0.9)	2.6(0.9)	2.4(0.8)	2.6(1.2)	2.6(1.1)	2.4(0.9)	2.4(0.9)	2.4(0.9)	2.3(0.9)	2.5(0.9)	2.8(1.0)	2.5(1.1)
31-40 (N=23)	3.1(1.1)	3.0(0.9)	3.2 (0.9)	2.9(0.9)	3.3(0.9)	3.2(1.1)	3.0(0.7)	3.0(0.9)	2.8(0.9)	3.1(0.9)	3.2(0.9)	3.4(1.0)	3.2(1.2)
More than 40 (N=10)	2.7(1.1)	2.7(0.9)	3.0(0.9)	2.8(0.9)	3.2(0.9)	3.1(1.1)	3.0(0.7)	2.7(0.8)	2.7(0.9)	2.3(0.8)	2.7 (1.0)	3.1(1.3)	3.0(1.1)
F(*p*-value)	1.2(0.3)	1.4(0.3)	2.5(0.04)	2.3(0.1)	1.9(0.1)	1.7(0.2)	3.1(0.01)	2.2(0.1)	1.4(0.2)	3.3(0.01)	2.3(0.1)	1.9(0.1)	2.4(0.05)

Table 5: *F*-test for Pulmonary Function by Age, Occupation, Smoking Duration and Number of Cigarette Smoked per Day.

	FEV1	FVC	FEV1/FVC Ratio	PEF
Age Category				
20 or less (N=35)	1.83(0.98)	4.66(1.04)	39.27	2.37(1.39)
% predicted	87.56	23.24		
21-30 (N=54)	1.67(0.87)	4.67(0.84)	35.76	2.03(0.78)
% predicted	86.79	23.12		
31-40 (N=6)	1.78(0.43)	5.30(4.46)	33.59	2.45(0.90)
% predicted	84.40	22.75		
More than 40 (N=2)	1.97(0.40)	3.21(0.99)	61.37	2.85(0.69)
% predicted	81.00	22.22		
F(*p*-value) for observed values	0.29(0.83)	1.18(0.32)		1.16(0.33)
Occupation				
Student (N=62)	1.73(0.88)	4.61(0.93)	21.69	2.19(1.16)
% predicted	87.29	23.20		
Staff (N=25)	1.76(1.05)	4.79(0.95)	36.74	2.20(0.89)
% predicted	86.62	23.10		
Teacher (N=10)	1.74(0.42)	4.82(3.43)	36.099	2.17(0.78)
% predicted	84.18	22.72		
F(*p*-value) for observed values	0.008(0.99)	0.205(0.82)		0.005(0.995)
Age Start Smoking				
8-15 (N=25)	1.32(0.76)	4.27(0.74)	30.91	1.69(0.69)
% predicted	87.22	23.19		
16-23 (N=68)	1.88(0.91)	4.88(1.51)	38.52	2.34(1.12)
% predicted	86.81	23.12		
More than 23 (N=4)	1.96(0.32	3.77(1.38)	51.989	2.89(0.69)
% predicted	83.90	22.67		
F(*p*-value) for observed values	4.04(0.02)	2.79(0.07)		4.70(0.01)
Number of Cigarette				
10 or Less (N=3)	2.19(0.51)	4.30(1.14)	50.93	2.50(0.74)
% predicted	86.07	23.01		
11-20 (N=11)	2.20(0.97)	4.42(1.11)	49.77	2.62(1.12)
% predicted	87.02	23.16		
21-30 (N=50)	1.83(0.89)	4.83(0.92)	37.89	2.34(1.17)
% predicted	86.98	23.15		
31-40 (N=23)	1.56(0.74)	4.29(0.93)	36.36	1.86(0.75)
% predicted	86.62	23.09		
More than 40 (N=10)	1.04(0.80)	5.18(3.29)	20.08	1.63(0.70)
% predicted	86.30	23.04		
F(*p*-value) for observed values	3.16(0.018)	1.11(0.358)		2.14(0.082)

4. Discussion

The aim of the current study was to assess motives that influence smokers' decision to use tobacco, the impact smoking has on pulmonary function and possible associations among those outcomes as well as with related background characteristics of study participants. With regard to psychological motives, the current study results revealed that the mean values for the different subscales of smoking motives was equivocal, ranged between 2.5 to 2.8; with the highest mean scores for motives among the participants were related to craving, cue exposure/associative process, tolerance, affiliates attachment and social/environmental goads. Accordingly, Piper *et al.* (2004) showed that those motives especially craving, tolerance, affiliates attachment and associative process are related to dependence which is, at heart, a motivational phenomenon and young people are especially vulnerable because of pressure from their peers and the image that smoking is clever, it helps them to feel more relaxed or cope with stress. Our findings in craving motives was in accordance with Chandra, Scharf and Shiffman (2011), who found that craving was positively associated with smoking, as higher craving predicted more subsequent smoking and higher smoking predicted lower craving.

This was also in agreement with Kristjanssona, Pergadiaa and Agrawala (2011) who used exploratory structural equation modeling (ESEM), to quantify six smoking expectancies, including negative affect reduction, boredom reduction, weight control, taste manipulation, craving/addiction and stimulation-state enhancement. Results of their validity analysis indicated that all of these expectancies were associated with Nicotine Dependence. On the same vein, Darlow and Lobel (2012), who reported that people often have multiple reasons for engaging in smoking behavior, and that the dominant reason for engaging in the behavior was usually nicotine dependence.

Concerning the influences of social/environmental goads, this motive also plays an important role in motivating Nicotine use Social learning theory, proposed by Bandura, posits that individuals can learn by observing the behavior of others. Modeled smoking behavior may not only influence initiation, but if there is a lack of abstinence behavior modeled; it may be very difficult for smokers to quit. Our results regarding social /environment motive was in line with Guo *et al.* (2010), who found that among all studied smokers, curiosity, social image and social belonging, coping as well as engagement and mental enhancement were the most frequently-ranked social attribution factors for smoking.

Moreover, Colder *et al.* (2006) stated that college may be a particularly important period to initiate smoking and the workplace was also an important setting for uptake of regular smoking. Other factor is the peer influence on predicting smoking behavior as they indicated that simple peer influence models didn't completely explain adult smoking and that a more complex interrelationship exists between smoking, peer's smoking and peer socialization.

Further, the current study showed that some of the psychological motives differed significantly with number of cigarettes smoked per day among the study participants. It has been shown that those participants who smoke 31 cigarettes and more, done so for the following motives: cue exposure/associative process, behavioral choice/melioration, positive reinforcement, and weight control. Our findings are in agreement with Urbán and Demetrovics (2010) who reported that smoking status had a strong association with positive and negative reinforcement and had a somehow weaker relationship with appetite and weight control expectancy. These findings could be explained by two points of views; the first is that, higher positive and negative reinforcement expectancies drive the experimentation and regular use of cigarettes. On the other hand, positive and negative reinforcement expectancies develop through the experimentation and more regular use of tobacco. Although, the previous researches showed some agreements, there are still other inconsistencies which could be attributed to the nature and characteristics of the studies groups as well as to the nature of the outcomes measures being used.

Smoking related changes in pulmonary function are analyzed in the current study. The results demonstrated a significant decline in most of pulmonary function indices, particularly those related to FEV1, FEV1/FVC and PEF among the study participants. As has been shown, the mean percentage of predicted values for (FEV1) was 83% ± 0.9; mean forced vital capacity (FVC) was 4.6 ± 1.3 while the ratio of FEV1/FVC was as low as 45% ± 1.2), indicating that participants had complained mild pulmonary obstruction combined with restriction according to global initiative for chronic obstructive lung disease (GOLD) (Tashkin & Murray, 2009; Maestú & de Pedro, 2012). The authors emphasized that chronic obstructive pulmonary disease (COPD) can be diagnosed when the FEV1/FVC ratio is below 70%.

Nighute and Awari (2011) contended that cigarette smoking has extensive impact on the respiratory functions and it has been clearly implicated in the aetiology of a number of respiratory diseases, particularly chronic bronchitis, emphysema and bronchial carcinoma. As further explained by Green and Pinkerton (2004), smoking has many effects on the lung that enhance lung aging, including accelerated maturation of the fetal lung, impairment of lung growth and acceleration of age-related declines in FVC and FEV1. Therefore, it is not too surprising that the values for FEV1/VC and the peak flows at expiration and inspiration, which mirror the larger airways affection, were significantly low among the current study participants.

These results are in accordance with those reported by several previous studies that showed reduction of different values of PFTs among smokers (Chinn *et al.*, 2005; Makrisa *et al.*, 2007; Unverdorben *et al.*, 2010; Boskabadya *et al.*, 2011). Boskabadya, *et al.* (2011) study demonstrated profound effect of smoking on PFTs specially those of PEF and MEF_{75} that was significantly more affected than other values, indicating that medium and large airways are more affected by smoking than other airways. Unverdorben *et al.* (2010) have also reported that chronic smoking related changes in pulmonary function are reflected as accelerated decrease in FEV1 although histologic changes occur in the peripheral bronchi earlier. Moreover, in a follow up study of 6654 participants over three years, Chinn *et al.* (2005) analyzed changes in lung function by change in smoking. The authors showed decline in FEV1 was higher in smokers and lower in male sustained quitters and those who quit. The variations in reduction of different PFT values among those studies could be related to the type of cigarettes smoked, the age of studied population or duration and/or quantity of smoking.

In addition, the current study looked at the associations between pulmonary function and participants' background characteristics; these included age, BMI, smoking rate, and age at start of smoking. The present study demonstrated that age and BMI were not found to have any association with PFT as opposed to number of cigarettes smoked and age at start of smoking. These results had some consistencies and other inconsistencies with previous research work; the explanation of which will be presented.

Concerning age factor, the association between age and PFT was not proven in the current study, despite its complex influence in lung function that has been shown in previous research work (Adedoyin *et al.,* 2010; Schnabel *et al.,* 2010). The results of the study by Adedoyin *et al.* (2010) demonstrated a high negative relationship between age and lung function. On the same vein, cross sectional population-based study was performed in the city of Tromsø, Norway, in 2001–2002 by Medbø and Melbye (2007) found that a predicted decreased FEV1% and FEV1/FVC ratio were associated with smoking, increasing age and reported pulmonary diseases. The sample population of those studies were older compared to the present study which might be the reason for the differences in the results. The age range of the participants in the present study was 18 to 58 years with the majority age was less than 30 (89 participants out of 97), while age of participants ranged between 40 to 70 years in Adedoyin *et al.* (2010) study, and 60 and older in Medbø and Melbye (2007) study had an age. On the other hand, the current study participants were not homongenous group within the different age categories because of nature of participants and their distribution in that specific college community as the majority of them were students with a limited age range.

Regarding the BMI, despite those previous studies in smoking and obesity which had shown to affect lung function adversely, this was not proven in the present study, concordant with the findings of Fogarty, Lewis, McKeever and Britton (2011). On the contrary, Santanaa *et al.* (2006) found that changes in pulmonary function were related to morbid obesity. It might be implying that although we are seeing no association between weight and PFT, this may be because they have normal range of BMI. Our findings of the BMI, the mean of which was 23.6 ± 4.0 kg/m2, indicating that obesity was uncommon among the study participants. This result was consistent with previous research that has shown that smokers tend to have a lower prevalence of obesity than non-smokers (Kawada, 2004; Gruber & Frakes, 2006; Flegal, 2012). Travier *et al.* (2012) reported that current smokers on average weigh less than never smokers which they attributed to the fear of gaining weight which necessitates a better understanding of this complex relationship. Smoking therefore has been shown to be one of the predictors of successful maintenance of weight loss (Phelan, Wing, Loria, Kim & Lewis, 2010). Since the majority of our participants were in their early adulthood so they have great weight control concerns which has been supported by their high mean score for weight control motive. This weight concern potentially leads them to a variety of unhealthy behaviors, including using smoking as a method of weight control (Sanchez-Johnsen, Carpentier & King, 2011; McVay & Copeland, 2011).

The observed inverse association between smoking rate/quantity as well as the age at start of smoking and PFT decline was supported by the literature, both measures were negatively related to PFT (Adedoyin *et al.*, 2010) that was significantly lower in chronic and heavy smokers (Boskabady, Dehghani & Esmaeilzadeh, 2003; Boskabady, *et al.*, 2011). Moreover, the results of the present study found that participants who started smoking before age of 23 had significantly shown lower values for most of the lung function indices FEV1 compared to those who started later. Nevertheless, the greater decline in FEV1 in those who smoked more than 10 cigarettes per day compared to those who are smoking less suggests that both duration and quantity of smoking has profound effect on the airways.

The recent study of Boskabady *et al.* (2011) evaluating the pulmonary function tests and respiratory symptoms in 176 smokers, also showed correlations between smoking rate, duration with values and reduction of most PFTs values, further supporting the results of the present study. Furthermore, Pasupathi *et al.* (2009) emphasized that smoking is responsible for approximately 90% of the COPD that occur among adults; the risk of which increases with increasing intensity and duration of smoking. In addition, changes of FEV 1 have been reported to take 1 year to develop depending on factors such as the intensity and duration of cigarette smoke exposure (Simmons *et al.*, 2005; Unverdorben *et al.*, 2010).

Finally, the findings from the present study could not prove any relation between pulmonary function indices and psychological motives for smoking. Both had shown weak correlations and most of these associations were negative. This result could be attributed to the limited sample size and the fact that study participants did not really vary significantly regarding their smoking motives as indicated by the results of the current study.

Conclusion

It is concluded that all the parameters of the lung function tests were reduced significantly among study participants group. These altered parameters are suggestive of mild obstructive pulmonary diseases. The current study also ascertained that study participants' airflow limitation was related to the number of cigarettes smoked per day and the age at start of smoking. In addition, different smoking dependence motives were similarly reported among the study participants and they had shown weak correlations with pulmonary function. Replications of the current study with a bigger sample size is recommended which might facilitate clearer understanding of the smoking nature and its motivational mechanisms to be betterpositioned to prevent its development in novice smokers and decreased the risk of chronic pulmonary diseases among these students and workers in the universities settings.

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