RESEARCH ARTICLE

DETERMINANTS AND PREDICTORS OF SMOKING CESSATION AMONG UNDERGRADUATE AND GRADUATE MEDICAL STUDENTS: A CROSS-SECTIONAL STUDY IN A PRIVATE MEDICAL COLLEGE.

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Manuscript Info	*Abstract*

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Objectives: The present study aimed to assess the prevalence and predictors for smoking cessation among undergraduate and graduate students of medical college.

Methods: This cross-sectional study was conducted at a private Medical College in Riyadh, Saudi Arabia, from February 2016 to April 2016. A semi-structured questionnaire was administered to 2nd to 6th year and graduate medical students who were smokers or had quitted smoking during medical college. Demographic, academic and smoking assessment data was collected. Additionally, the contribution of medical knowledge in quitting smoking was assessed.

Results: The study included a total of 88 students (64 [72.7%] males; 73 [83.1%] aged below 25). Of these, 21.6% had quitted smoking during medical school, while the remainders continued smoking. Ex-smokers' status was found to be associated with older age (p=0.002), superior academic level (p=0.026) and history of several quit attempts (p=0.047). The two groups were comparable in terms of duration, frequency, and amount of smoking. The number of students who reported to have acquired enough medical knowledge about smoking-related pathologies was greater in current smokers (92.8%) than in ex-smokers (78.9%); but without statistical significance.

Conclusion: The present study showed that more than one-fifth medical students quit smoking during medical college, and the likelihood to quit increases with age and academic level of the student and quit attempts in the past. No direct correlation between quitting smoking and acquired medical knowledge was reported; however, there is a possible correlation between quitting smoking and aquiring basic theoretical knowledge in the first 4 years.

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Introduction:-

The prevalence of smoking among healthcare professionals remains high despite of acquiring detailed knowledge of the harmful effects of smoking.[1–3]This constitutes a real challenge to public health in regards to their key role in the fight against smoking. Studies have demonstrated that smoking healthcare professionals are less prone to provide smoking cessation advice to their patients, even to those with high risk comorbidities such as pregnant women or oral contraceptive users. [4–6] The proficiency in providing such advice is even more affected in healthcare professionals who are highly dependent to nicotine.[7]

In Saudi Arabia, the prevalence of smoking behavior among medical students is estimated to be 19% to 25%, which is relatively comparable to the smoking prevalence in other university students or general adult population.[8–10]These observations contrast with the good knowledge among this specific population about smoking-related health hazard; which is sensibly more than the population average. [8] The other issue behind that concern is the lack of effective training about tobacco dependence assessment and smoking cessation strategies among medical students.[11] Besides the known health-related risks, smoking is associated with low academic achievements, poor grades and decreased educational attainment. [12–15] In countries like Australia, the prevalence of smoking among healthcare professionals was found to be lower than in general population, [16] while a decline in the incidence of smoking was observed among American medical students in last two decades. [17] In other countries like Italy, the prevalence of smoking was reported to be higher than in general population. [18]

Nevertheless, psychology and behavior studies have demonstrated that acquiring awareness promotes decision making and helps resisting the temptations of smoking, thereby inducing the cognitive process of smoking cessation. Conversely, a positive perception towards smoking is associated with deprived decision-making and lack of self-efficacy. [19,20] Therefore, there is more than one reason to expect a lower prevalence of smoking among medical student. Knowledge of the long-term detrimental consequences of smokinghelps in remodeling functional meaning of tobacco use and reinforces beliefs about individual and general harms of smoking.

This study estimated the prevalence of smoking quitters among undergraduate and graduate medical students and analyzed the correlation between acquiring medical knowledge of the harmful effects of smoking and the smoking cessation decision. In addition, further predictors of smoking cessation during medical school were analyzed.

Methods:-

This was a cross sectional study involving current smokers among medical students and those who quitted after receiving medical knowledge at AlMa'arefa Medical College, Ad Diriyah, Riyadh, Saudi Arabia. A semi-structured questionnaire was administered to all male and female undergraduate and graduate medical students who consented to participate in the study. Students were called to participate through an announcement and the flyers distributed among the students. The bilingual flyers (English and Arabic) ,briefly explained the objectives and importance of the study and participation modality. Participants who were unable to complete the questionnaire during working hours were offered the option of telephonic interview.

Questionnaire:-

The questionnaire was devided into 3 parts: 1) demographic and academic data, such as age, gender and student's level; 2) characteristics of smoking, such as age of initiation, duration of smoking and number of cigarettes smoked in a day ; 3) factors that may have correlation with quitting, such as perception about cigarette price, exposure to people who try to prevent from smoking, the existence of quit attempts, perceived negative effects of smoking and the most important motivation for smoking.

Data wascollected anonymously and the study was approved by the institutional review board of AlMa'arefa Medical College.

Statistical analysis:-

Data was analyzed through SPSS software (Version 21). Descriptive statistics were carried out to analyze the distribution of the population within the different variables' categories. Chi-square test and Fisher's exact test were undertaken to analyze correlation between nominal variables, including comparison between students who quitted smoking and those who did not. Binary logistic regression was carried out to analyze predictors of quitting smoking,

using the student's smoking status (smoker, ex-smoker) as the dependent variable and relevant factors as independent variables in univariate and multivariate models. Statistical significance was set for a $P < 0.05$.

Results:-
Population characteristics:
The study included total 88 students, 64 (72.7%) males and 73 (83.1%) aged below 25, and 19.3% in the 4th year, 29.5% in 5th year and 22.7% in 6th year. Assessment of smoking status showed that 21.6% of the participants have quit smoking during the medical school, while the remainders continued smoking. In majority of smokers, age of smoking onset was between 15-21 years (68.2%). Regarding use of tobacco, 65.9% were daily smokers and one third (35.2%) smoked or were smoking less than 10 cigarettes per day (Table 1).

Table 1:- Demographic and academic characteristics and smoking assessment of the population

| Variable	Category	Frequency	Percentage
Age (year)	18-21	12	13.6
	22-25	61	69.3
	26-29	7	8.0
	≥30	8	9.1
Gender	Male	64	72.7
	Female	24	27.3
Position	2nd year	8	9.1
	3rd year	7	8.0
	4th year	17	19.3
	5th year	26	29.5
	6th year	20	22.7
	7th year	4	4.5
	Graduate	6	6.8
Smoking assessment			
Smoking status	Current smoker	69	78.4
	Ex-smoker	19	21.6
Age of onset of tobacco use	8-14 years	9	10.2
	15-21	60	68.2
	22 or more	19	21.6
Duration of smoking	<1 year	9	10.2
	1-5 years	50	56.8
	>5 years	29	33.0
Frequency of tobacco use	Daily	58	65.9
	Every 2-3 days	15	17.0
	Once a week	9	10.2
	Once a month	6	6.8
Number of cigarettes per day	Up to 10	31	35.2
	11-20	35	39.8
	> 20	11	12.5
Type of tobacco used	Cigarettes	50	56.8
	Hubble-babble (Shisha)	11	12.5
	Both	26	29.5
	Others	1	1.1
Time of first daily cigarette	Wake up	36	40.9
	Lunch time	17	19.3
	Dinner time	25	28.4
	Before sleep	10	11.4
Situations that produces urge to smoke	Family	9	10.2
	Friends	45	51.1
	Solitude	28	31.8
	Other	6	6.8

Factors associated with quitting among medical students

Comparative analysis between current smokers and ex-smokers showed that smoking cessation was associated with advanced student's age (p=0.002) and superior academic level (p=0.026) (Figures 1, 2). Participants who reported to have acquired enough medical knowledge about smoking-related pathologies mainly belonged to the group of current smokers (92.8%) than in ex-smokers (78.9%); however, this result was not statistically significant. No difference was observed between the two groups regarding other smoking-related factors and smoking behaviors, such as duration of smoking (p=0.663); frequency of smoking (p=0.0148); and amount of smoking (p=0.783) (Table 2).

Figure 1:- Correlation between student's age and smoking status
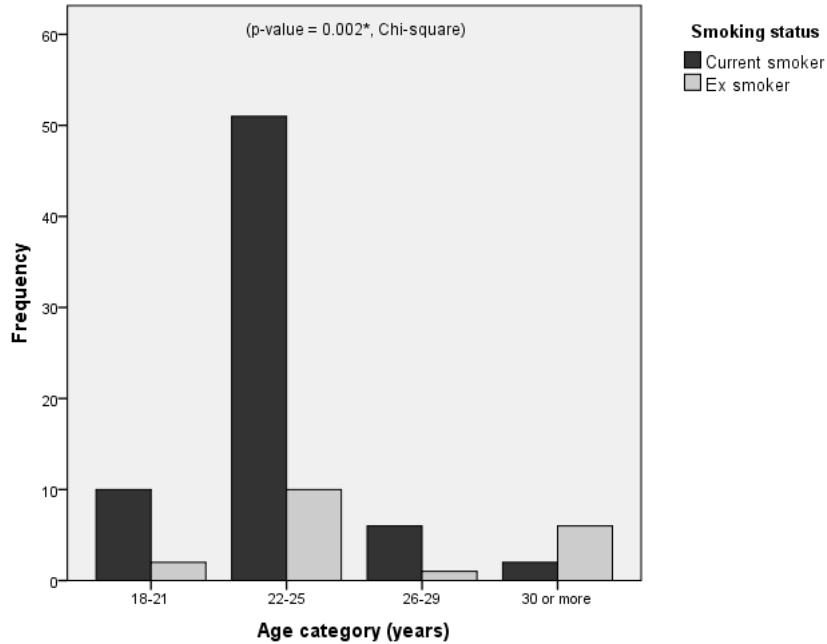
Figure 2:- Correlation between student's level and smoking status
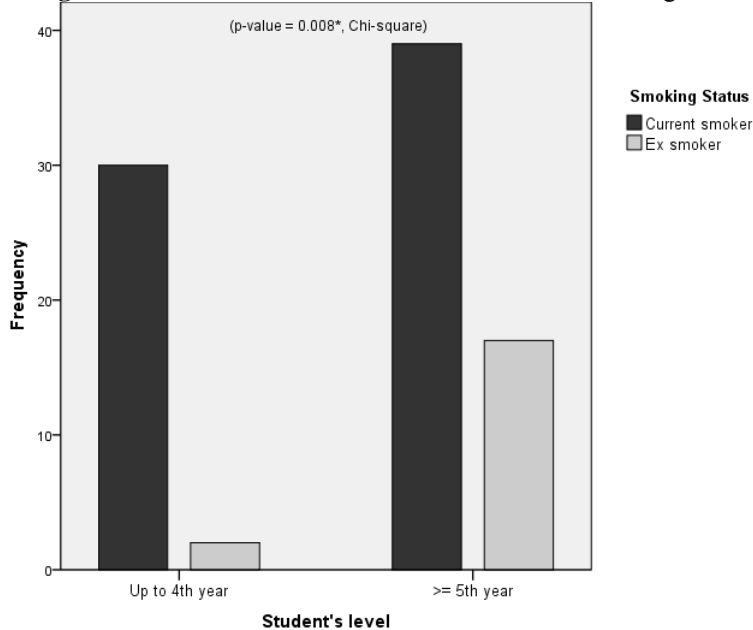
Table 2:- Factors correlated with quitting among ever smoker students

Factor	Category	Current smokers		Ex-smokers		p-value
		Freq.	%	Freq.	%	
Age (year)[1]	18-21	10	14.5	3	10.5	.002*
	22-25	51	73.9	10	52.6	
	26-29	6	8.7	1	5.3	
	≥30	2	2.9	6	31.6	
Gender	Male	51	73.9	13	68.4	.634
	Female	18	26.1	6	31.6	
Position	2nd year	7	10.1	1	5.3	.026*
	3rd year	7	10.1	0	0.0	
	4th year	16	23.2	1	5.3	
	5th year	19	23.2	7	36.8	
	6th year	14	27.5	6	31.8	
	7th year	4	20.3	0	0.0	
	Graduate	2	5.8	4	21.1	
Student's level (2 categories)	Up to 4th year	30	43.5	2	10.5	.008*
	≥ 5th year	39	56.5	17	89.5	
Smoking pattern						
Age of smoking onset	8-14 years	7	10.1	2	10.5	.473
	15-21	49	71.0	11	57.9	
	22 or more	13	18.8	6	31.6	
Duration of smoking	<1 year	6	8.7	3	15.8	.663
	1-5 years	40	58.0	10	52.6	
	>5 years	23	33.3	6	31.6	
Continual smoking	No	21	30.4	10	52.6	.0.73
	Yes	48	69.6	9	47.4	
Frequency of tobacco use	Daily smoker	49	71.0	9	47.4	.054
	Non-daily smoker	20	29.0	10	52.6	
Number of cigarettes per day	≤10	26	41.9	5	33.3	.542
	>10	36	58.1	10	66.7	
Type of tobacco used	Cigarettes	41	59.4	9	47.4	.550
	Shisha	7	10.1	4	21.1	
	Both	20	29.0	6	31.6	
	Others	1	1.4	0	0.0	
Time of first daily cigarette	Wake up	29	42.0	7	36.8	.684
	Other	40	58.0	12	63.2	

* Statistically significant result (p<0.050).

Perceptions and attitudes correlated with quitting among medical students
Comparison of perception and attitude towards smoking and smoking cessation between the two groups showed that ex-smokers were more likely to have made several quit attempts (p=0.047). No other significant differences were observed between the two groups regarding other investigated parameters, such as perception about cigarettes' price (p=0.726); exposure to people who advice student to quit smoking (p=0.135); situations that urge to smoke (p=0.590); or motivations for smoking (p=0.191) (Table 3).

Table 3:- Smoking-related perceptions and attitude in ex-smokers by comparison to current smokers

Perception/attitude	Category	Current smokers		Ex-smokers		p-value
		Freq.	%	Freq.	%	
Situations that produces urge to smoke	Family	6	8.7	3	15.8	.590
	Friends	34	49.3	11	57.9	
	Solitude	24	34.8	4	21.1	
	Other	5	7.2	1	5.3	
Cigarette price	Not costly	26	37.7	8	42.1	.726
	Costly	43	62.3	11	57.9	
Exposure to people who try to prevent from smoking	No	17	24.6	8	42.1	.135
	Yes	52	75.4	11	57.9	
Medical knowledge regarding pathology[1]	Not enough	5	7.2	4	21.1	.079
	Enough	64	92.8	15	78.9	
Quit attempts	No	25	36.2	2	10.5	.047*
	Yes	44	63.8	17	89.5	
Most influential person to quit smoking	Father	12	17.4	3	15.8	.972
	Mother	19	27.5	5	26.3	
	Brother	5	7.2	2	10.5	
	Other	33	47.8	9	47.4	
Are there new strategies to persuade smokers to quit?	No	21	30.4	9	47.4	.168
	Yes	48	69.6	10	52.6	
Most negative effect of smoking on smokers	Bad smell	30	43.5	6	31.6	.136
	Feeling of guilt	16	23.2	9	47.4	
	Cough	16	23.2	4	21.1	
	cost	7	10.1	0	0.0	
Physicians helpful to smoking cessation	No	23	33.3	4	21.1	.404[‡]
	Yes	46	66.7	15	78.9	
Most important motivation for smoking	Relief stress	54	78.3	11	57.9	.191
	Reinforce friendship	6	8.7	4	21.1	
	Affordability of cigarette	7	10.1	2	10.5	
	Lack of education on pathological effects of smoking	2	2.9	2	10.5	
Stress factor	Yes	54	78.3	11	57.9	.085[‡]
	no	15	21.7	8	42.1	

[‡] Fisher's exact test; * statistically significant result (*P*<0.050).

Predictors of smoking cessation during medical school

In both univariate and multivariate regression analysis, predictors of smoking cessation during medical school among medical students were age ≥30 years (OR [95%CI]=8.39 [1.37; 51.27]; p=0.021); level ≥5th year (OR [95%CI]=5.51 [1.10; 27.58]; p=0.038); and history of multiple attempts to quit smoking (OR [95%CI]=5.33 [1.03; 27.54]; p=0.046) (Table 4).

Table 4:- Predictors for smoking cessation among medical students (binary logistic regression)

Predictor / category	OR	95%CI		p-value
Univariate models				
Age				
18-21 (reference)	-	-	-	.019*
22-25	0.98	0.19	5.17	.981
26-29	0.83	0.06	11.28	.981
≥30	15.00	1.65	136.17	.016*
Age				
< 30 years (reference)	-	-	-	-
≥ 30 years	15.46	2.81	85.23	.002*
Student's level				
Up to 4th year (reference)	-	-	-	-
≥ 5th year	6.54	1.40	30.52	<.001*
Quit attempts				
No (reference)	-	-	-	-
Yes	4.83	1.03	22.65	.046*
Time of first cigarette				
At wake-up (reference)	-	-	-	-
Other	1.24	0.44	3.54	.684
Multivariate models				
Age				
< 30 years (reference)	-	-	-	-
≥ 30 years	8.39	1.37	51.27	.021*
Student's level				
Up to 4th year (reference)	-	-	-	-
≥ 5th year	5.51	1.10	27.58	.038*
Quit attempts				
No (reference)	-	-	-	-
Yes	5.33	1.03	27.54	.046*

* Statistically significant result (p<0.050)

Discussion:-

This cross-sectional study investigated the correlation between acquired medical knowledge and smoking cessation among medical students. It also analyzed other factors associated with smoking cessation by comparing demographic, academic and smoking-related factors between current smokers and ex-smokers. Results showed no correlation between quitting smoking and the principle factor, which was knowledge about smoking-related pathology as self-assessed by the participants. In addition, ex-smoker-to-current smoker ratio was 0.28 in this study sample, which may represent a low value in regards to the studying field and the status of future health professionals. Al-Turki et al. who also investigated smoking behavior in Saudi medical students found a higher ex-smoker-to-current smoker ratio (0.41); however, only male students were included in the study. [9] Another survey among Chinese medical students reported an even lower ratio of ex-smokers (0.14) with reference to current smokers. [21] A study in Philadelphia, USA, showed a higher percentage of ex-smokers among nursing students (17.8%) as compared to medical students (9.8%).[17] These relatively low rates of ex-smokers among medical students may indicate the low impact of the level of knowledge about smoking-related health risks on smoking behavior. This also suggests the existence of other determinants for smoking cessation that should be defined to improve awareness and reinforce quitting decision in this specific population.

On assessing the other factors, it was reported that student's age (≥30)and advanced school year (>4th year) in addition to a history of multiple quit attempts were associated with higher smoking cessation rates. The 4th year of medical school cut-off may advocate for the level of knowledge about smoking-related risks, as it coincides with the completion of theoretical teaching and clinical rotation of respiratory system, which includes the major part of smoking-related pathology. A longitudinal cohort study by Chaiton et al. demonstrated that it might take up to 30 attempts for an average smoker before successful quitting. [22] Older studies have demonstrated that addictive

substance consumption in adolescent was inversely correlated to the level of psychosocial maturity. [23] Therefore, the significance of age may simply indicate the progression in time of the student's smoking behavior, as impacted by experience acquisition and intrapsychic conflict resolution, thereby resulting in multiple quit attempts before successful quitting. This also suggests that multiple quit attempts can be a natural process in the maturation of the quitting action.

Regarding patterns of tobacco use, we found that cigarettes were the most frequently used form of tobacco, with no difference between current and ex-smokers. Similarly, there was no difference in age of onset and duration of smoking, nor the number of daily cigarettes smoked. In Al-Turki's series, shisha (hubble-babble) was the most frequently used tobacco form with 44.1% of smokers, while cigarettes were used by 32.2% of the participants only. [9] Conversely, occasional (non-daily) smoking was more frequently reported in the group of ex-smokers in our study, however, this was not statistically significant (p=0.054). This contrasts with findings from a study by Fagan et al., who investigated the quit attempts among American young adults and found that daily smokers were more prone to making quit attempts and expressing intention to quit. [24] This difference could be explained by cognitive factors between the two populations' characteristics ; future health professionals may develop a harm reduction attitude in smoking, which associates reduction of smoking intensity and multiplication of quit attempts.

On the other hand, feeling of guilt was significantly prevalent in ex-smokers (p=0.038; results not presented in Tables). While the stress factor was more prevalent in current smokers, although not statistically significant (p=0.085). Feeling of guilt may contribute in smoking cessation and could be linked to religious motivation, as cigarette smoking is considered illicit in Muslim community. A study by Al-Kaabba et al., demonstrated that religious reasons were amongst the important motivations for not smoking among medical students in Riyadh, Saudi Arabia. [25] Feeling of guilt could also be linked to other reasons, such as the risk to others, [26] or more specifically the medical students' status of future health professional, who should exemplarily keep a healthy lifestyle. Several studies highlighted the contribution of stress as one of the major factors motivating for smoking and smoking onset and preventing from quitting. [21,27] During medical school, stress can be induced or exacerbated by high effort-reward imbalance, with particularly high prevalence during the three first years where it could associate sub-depressive symptoms and abnormal behaviors including smoking. [28,29] This might explain the lower proportion of smoking quitters in young-aged students as compared to older students.

The influence of peers is largely reported as a significant factor in smoking. [9,30] In this study, no impact of the influence of peers or relatives on smoking cessation was reported. However, ex-smokers tended to be more exposed to people who tried to prevent them from smoking (p=0.135). An experiment that attempted to explain the mechanisms of peer influence on smoking behavior suggested that young adults' are generally attracted to smoking by passive imitation of their peers, rather than by an active incitation to smoke. [31] This conclusion is supported by another study on adolescents that highlighted the positive impact of parents' non-smoking attitude in reducing the risk of smoking in their children. [32] In this study, parent's smoking behavior was not assessed, while their active role did not show significant influence on quitting smoking among participants.

To summarize, these findings point toward an integrative multifactorial model, where common psychosocial factors interact with those specifically encountered in the target population. Population-specific factors included school issues, such as academic pressure; and cognitive factors such as the "more-than-the-average" knowledge about smoking-related health risks with regards to the study field. Therefore, specific actions are warranted to fight against medical students' smoking, in addition to common public actions. More targeted educational programs should be implemented in medical schools and innovative therapeutic techniques should be designed for medical students to help them quit smoking.

The limitations of the study included relatively small sample size, missing factors for simplification purpose and to increase participation rate, these included student's economic status, parents' educational level and smoking behavior,etc.,.

Conclusion:-
Less than 1 out of 4 medical students quit smoking during their medical school. No direct correlation between quitting decision and smoking-related medical knowledge was reported. These results are suggestive of the weak impact of the level of knowledge about smoking-related health risks on smoking behavior among medical students.

Students who were more likely to quit smoking during medical school were those aged ≥30, who had completed 4 years of study, and who had frequent quit attempts by the past.

A multifactorial model including population-specific and nonspecific determinants of smoking cessation should be established to guide specific preventive and therapeutic actions in fighting against smoking among medical students.

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