

RESEARCH ARTICLE

Smoking Cessation Treatment and Outcomes in Medium to Heavy Cigarette Smokers being Treated for Cancer in Jordan

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Abstract

Background: Studies evaluating smoking cessation treatment outcomes in cancer patients are scarce, despite smoking cessation importance in cancer care. We sought to add to the literature by evaluating smoking cessation in a challenging group of cancer patients (medium-to-heavy smokers) visiting an out-patient smoking cessation clinic (SCC) in a cancer center in Amman, Jordan. **Materials and Methods:** Patients smoking >9 cigarettes per day (CPD) and referred to the SCC between June 2009 and May 2012 were studied. Clinic records were reviewed to measure demographic and baseline clinical characteristics, and longitudinal (3-, 6- and 12- month) follow-up by phone/clinic visit was conducted. At each follow-up, patients were asked if they experienced medication side-effects, if they had returned to smoking, and reasons for failing to abstain. Descriptive and multivariable logistic regression analyses were performed. **Results:** A total of 201 smokers were included in the analysis. The 3-month abstinence was 23.4% and significantly associated with older age, being married, and presenting with lower (≤ 10 ppm) baseline carbon monoxide (CO) levels. On a multivariable level, lower CO levels, a higher income (relative to the lowest income group), being older, and reporting severe dependence (relative to dependence reported as 'somewhat' or 'not') were significant predictors of higher odds of abstinence at three months. Reasons for failing to quit included not being able to handle withdrawal and seeing no value in quitting. Long-term ARs did not reach 7%. **Conclusions:** In a sample of Jordanian smokers (>9CPD) with cancer and receiving smoking cessation treatment, ARs were low and further declined with time. Results underscore the need for more aggressive patient management and rigorous follow-up during and after smoking cessation treatment, particularly when this takes place in challenging settings. Observed reasons for failure to abstain should be used to tailor counseling practices.

Keywords: Smoking cessation - cancer patients - abstinence rates - failure to quit

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Introduction

Continued tobacco use after a cancer diagnosis has been associated with various detrimental clinical outcomes such as shorter survival (Videtic et al., 2003; Fox et al., 2004; Sardari Nia et al., 2005; Zhou et al., 2006; Nguyen et al., 2010; Parsonset al., 2010; Kenfield, et al., 2011); increased risk of tumor recurrence or development of secondary malignancies (Do et al., 2003; Kawaguchi et al., 2006; Garces et al., 2007; Kaufman et al., 2008; Li et al., 2009; Joshu et al., 2011); poorer response to treatment and an increased risk of treatment toxicities (Monson et al., 1998; Dresler, 2003; O'Sullivan et al., 2003; van der Bol et al., 2007; de Jong et al., 2008; Waller et al., 2011; Petros et al., 2012); an increased risk of surgical complications (Moller et al., 2002; Barrera et al., 2005; Selber et al., 2006; Liu et al., 2011); and inferior bone marrow transplantation outcomes (Marks et al., 2009; Ehlers et al., 2011; Tran et al., 2011). Conversely, smoking cessation post- cancer diagnosis has been associated with better pain control and

an improved quality of life (Garces et al., 2004; Baser et al., 2006; Daniel et al., 2009; Ditre et al., 2011). It is thus not surprising that tobacco cessation measures are now included in the evaluation of healthcare quality (Fiore et al., 2012), and the integration of tobacco dependence treatment (TDT) is emphasized as an important service to establish within oncology practice settings (Mazza et al., 2010; 2011; Goldstein et al., 2012).

Given the value of TDT, numerous studies have evaluated TDT in smokers under various contexts (Hughes et al., 2007; Hajek et al., 2009; Cahill et al., 2012; Rigotti et al., 2012; Stead and Lancaster, 2012; Stead et al., 2012). However, substantially less studies have been conducted specifically within the context of cancer care (Gritz et al., 2006; Nayan et al., 2011). Even less have generated information on the practice and outcomes of TDT during cancer care, particularly in countries where sociocultural norms render exposure to secondhand smoke (SHS) a common challenge to those who would like to quit smoking.

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Evaluating the results of TDT programs in cancer patients would add to the literature regarding TDT outcomes, given that they vary substantially by setting and context. In Jordan, the prevalence of smoking is 26%, reaching 63% in 25-34 year-old males (Belbeisi et al., 2009; WHO, 2011); furthermore, approximately 60% of Jordanian households have at least one regular smoker, and 94% allow smoking within the house (Jordanian Department of Statistics, 2010). Thus, in addition to the difficulties faced as a result of their cancer diagnosis, smokers managed in our TDT clinic face a substantial challenge as a result of SHS exposure. Evaluating TDT in such settings can highlight the unique challenges and perspectives that ought to be considered when implementing TDT within the context of oncology practice in developing countries, especially given the rising burden of cancer in developing countries coupled with the increasingly global call for TDT.

The smoking cessation clinic (SCC) at King Hussein Cancer Center (Amman, Jordan) has been providing TDT since 2008. Given the importance of evaluating TDT outcomes, we previously reported one-year abstinence rates (ARs) in cancer patients that had visited the clinic in the period shortly after its inception (Hawari et al., 2012). Our results revealed acceptable ARs in light smokers but very low rates in smokers who consumed >9 cigarettes per day (CPD). In order to build on previous work, we sought to longitudinally follow medium to heavy smokers (>9 CPD) in order to specifically evaluate trends in ARs (i.e. short and long-term ARs) and reasons for failure to quit smoking in this challenging group of cancer patients.

Materials and Methods

Study design

The study was a prospective observational study, but medical chart reviews also were performed to collect patient clinical information. Longitudinal patient follow-up was ensured through clinic visits and follow-up phone calls.

Settings

The cessation clinic services provided at KHCC have been previously described (Hawari et al., 2012). In brief, the clinic offers both counseling and pharmacologic management. With regards to first-line pharmacologic management, smokers are started on the indicated dose of varenicline (0.5mg daily during days 1-3, to 0.5mg twice a day during days 4-7, 1.0mg twice a day until the end of treatment) or bupropion (150mg daily during days 1-3, followed by 150mg twice a day until the end of treatment), in combination with nicotine replacement therapy (nicotine patches and nicotine lozenges or gum – NRT is prescribed at an initially high dose proportional to the number of cigarettes smoked by the patient, and titrated down towards the end of treatment). NRTs are combined with oral agents (varenicline or bupropion) to help patients during the initial phase of up-titrating the dose of either oral agent, and to control acute urges and withdrawal symptoms that may continue to occur in the first few weeks of therapy after completely quitting

[with regards to varenicline and NRT in particular, a similar approach has been used in a residential smoking cessation program elsewhere (Ebbert et al., 2009)]. The choice between varenicline and bupropion is determined by clinical factors such as existence of contraindications to either drug, and the presence of comorbidities (e.g. depression) that may benefit simultaneously from TDT (e.g. bupropion is preferred in patients with a history of depression). Patients who cannot use NRT are placed on single-agent varenicline or bupropion. Finally, patients who are not eligible to receive varenicline or bupropion receive NRT alone in the form of nicotine patches and gums or lozenges. All patients receive medical counseling, including those who cannot take any medications at all. Treatment typically encompasses several visits to the clinic and spans at least three months.

Study sample

Cancer patients at King Hussein Cancer Center referred to the smoking cessation clinic between June 2009 and May 2012, and who smoked nine or more CPD [medium and heavy cigarette smokers were defined in accordance with previously published definitions in the literature, (Shavelle et al., 2008)]. The IRB at KHCC approved the study and waived the requirement for informed consent as the study was deemed to be of minimal risk.

Variables

Patients' cancer diagnosis was obtained from medical records, and then classified as either a smoking related cancer diagnosis or a non-smoking related cancer diagnosis. All other variables were measured through patient or physician-report using a standard data collection instrument completed within the clinic during patients' visits. Variables included: demographic characteristics (age, gender, educational level, and marital status); tobacco-related habits (age of onset of smoking, type and frequency of tobacco smoked, previous attempts to quit); patient's reported motivation and confidence to quit (very, somewhat or not/neutral); perceived dependence (very, somewhat, or not dependent); patients' Fagerstrom score of dependence (Heatherton et al., 1991); baseline exhaled carbon monoxide (CO) levels (measured in part per million, ppm, at first visit); and pharmacotherapeutic regimen prescribed (varenicline-based, bupropion-based, NRT-based, or counseling only). Finally, repeated point abstinence at three months, six months and one year was documented during clinic visits or a follow-up phone call. Patients who relapsed were asked about the most important reason(s) why they started smoking again.

Analysis

Descriptive statistics on patients' characteristics, ARs, and reasons for failure were generated. Comparison of patients who succeeded in quitting smoking at three months and those who did not was carried out using the T-test (for age) and Chi-square test for the following variables: gender; level of education (less than high school, high school, college or diploma, and university); marital status (married or single); reported income (<\$282.0, \$282.0-\$704, \$705-\$1408, and >\$1408); type

of cancer (smoking-related diagnosis or other); baseline exhaled CO level (whether or not it was greater than 10 ppm); age of onset of smoking (whether or not it was greater than 20 years at start); history of previous serious attempts to quit smoking (having no attempts, one or two attempts, or more than two attempts); number of cigarettes smoked daily (≤ 20 , 21-30, ≥ 30); perceived dependence on nicotine (very versus somewhat or not); Fagerstrom score (greater than six or not); and patients' perception of his/her level of motivation and confidence to quit smoking (very versus somewhat or not). Multivariable logistic regression was conducted to calculate the effect of each independent variable on the odds of being abstinent at three months, controlling for all other variables.

A significance criterion of $p < 0.05$ was used for the analysis. All analyses were performed using SPSS.

Results

A total of 201 cancer patients visited the smoking cessation clinic between June 2009 and May 2012. Characteristics of the patients included in the analysis are displayed in Table 1. The average age of the sample was 49 years. The majority of patients were males (80.1%), and most were married (82.1%). Approximately 63% of the sample did not exceed a high school level of education, and was largely comprised of low-income patients (less than 30% fell in the 'above \$704' monthly category).

With regards to smoking habits, a substantial (roughly 70%) proportion of patients visiting the clinic had begun smoking by the age of 20, and the majority (79%) had attempted to quit at least once. Over half (55.2%) were smoking between 10 and 20 cigarettes a day when they began their visits to the clinic, while roughly a third were smoking more than 30 cigarettes daily (the average number of daily cigarettes smoked was 28.6). Motivation and confidence to quit were confirmed by most patients, although the majority (81%) also perceived themselves to be highly dependent on nicotine. Perceived dependence did not align perfectly with Fagerstrom scores, which indicated that about 48% were highly dependent (having a Fagerstrom score of more than 6, i.e. "high dependence" or "very high dependence" (Heatherton, Kozlowski, Frecker, and Fagerstrom, 1991); the average Fagerstrom score was 6.4). Approximately 45% of referred patients had smoking-related cancers such as lung, urinary bladder, head and neck cancers and myeloid leukemia.

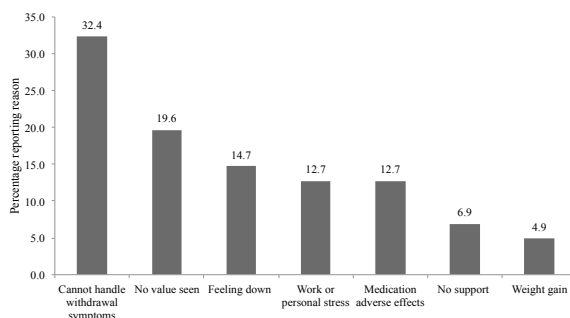


Figure 1. Reasons for Failure to Quit Smoking at Three Months in Non-abstainers Who Reported a Reason (n=102)

Roughly 83% of patients in the sample received some medication for smoking cessation (varenicline, bupropion, NRT). Three-month ARs for the sample did not exceed 24%. Approximately half the sample confirmed failure to abstain, and an abstinence status could not be ascertained for 25% of patients (who were thus assumed to be non-abstinent). For the 47 patients who succeeded in abstaining at three months, approximately 47% (22 of the 47 patients) remained abstinent at six months, and approximately 55% of those abstinent at six months (12 of the 22 patients) remained abstinent at 12 months, thus resulting in overall ARs of roughly 11% and 6% at six-months and one-year, respectively.

Cross-tabulations were conducted in order to examine possible variables that were associated with abstinence

Table 1. Characteristics of Patients Enrolled in Smoking Cessation Clinic

Variable	Average or count (%)*
Average age at clinic visit	Mean of 49.0 years
Gender	Male 161 (80.1%) Female 40 (19.9%)
Education	Less than high school level 65 (32.3%) High school 60 (29.9%) College/university 46 (22.9%) Other 28 (13.9%)
Marital Status	Married 165 (82.1%) Single/other 36 (17.9%)
Reported monthly income	<200 JD 60 (29.9%) 200-500 JD 80 (39.8%) 501-1000 JD 42 (20.9%) >1000 JD 15 (7.5%)
No. of cigarettes/day	20-30 111 (55.2%) 21-30 25 (12.4%) ≥ 31 65 (32.3%)
Age of smoking onset	≤ 20 140 (69.7%) >20 61 (30.3%)
Previous attempts to quit	Never attempted 42 (20.9%) Once or twice 69 (34.3%) Several times 90 (44.8%)
Baseline CO (PPM)	≤ 10 47 (23.4%) >10 149 (74.1%)
Fagerstrom Score	≤ 6 105 (52.2%) >6 96 (47.8%)
Dependence	Very dependent 163 (81.1%) Somewhat or not dependent 38 (18.9%)
Motivated to quit	Very motivated 185 (92.0%) Somewhat or not motivated 16 (8.0%)
Confident will quit	Very confident 137 (68.2%) Somewhat or not confident 63 (31.3%)
Cancer diagnosis	Hematologic cancer diagnosis (blood and lymph) 33 (16.4%) Smoking-associated cancer diagnosis Bladder/renal 21 (10.4%) Myeloid 12 (6.0%) Head and neck 31 (15.4%) Other (lung, esophageal, stomach) 25 (12.4%) Other solid tumor diagnosis 78 (38.8%)
Treatment received	Counseling 35 (17.4%) Bupropion \pm NRT 31 (15.4%) Bupropion alone 2 Varenicline \pm NRT 73 (36.3%) Varenicline alone 7 NRT 62 (30.8%)
Final patient status at 3 months	Abstained 47 (23.4%) Failed to abstain 102 (50.7%) Death 2 (1.0%) Missing information 50 (24.9%)

*Totals may not add to 100% due to missing values

Table 2. Characteristics of Patients Enrolled in Relation to Success or Failure to Quit Smoking at Three Months

Variable	Success at 3 months (n=47)	Failure/ drop-out (n=152)	Total (N=199)
Average age at clinic visit* (years)	52.6	47.3	49.0
Gender			
Male	39 (24.5%)	120 (75.5%)	159
Female	8 (20.0%)	32 (80.0%)	40
Education			
Less than high school	15 (23.4%)	49 (76.6%)	64
High school	13 (21.7%)	47 (78.3%)	60
University	12 (26.1%)	34 (73.9%)	46
Other	7 (25.9%)	20 (74.1%)	27
Marital Status*			
Married	43 (26.4%)	120 (73.6%)	163
Single/other	4 (11.1%)	32 (88.9%)	36
Reported monthly income			
<200 JD	7 (12.1%)	51 (87.9%)	58
200-500 JD	21 (26.2%)	59 (73.8%)	80
501-1000 JD	13 (31.0%)	29 (69.0%)	42
>1000 JD	4 (26.7%)	11 (73.3%)	15
No. of cigarettes/day			
20-30	25 (22.5%)	86 (77.5%)	111
21-30	9 (37.5%)	15 (62.5%)	24
≥31	13 (20.3%)	51 (79.7%)	64
Age of smoking onset			
≤20	34 (24.6%)	104 (75.4%)	138
>20	13 (21.3%)	48 (78.7%)	61
Previous attempts to quit			
Never attempted	9 (22.0%)	32 (78.0%)	41
Once or twice	18 (17.8%)	51 (68.0%)	69
Several times	20 (22.5%)	69 (77.5%)	89
Baseline CO (PPM)*			
≤10	18 (38.3%)	29 (61.7%)	47
>10	28 (19.0%)	119 (81.0%)	147
Fagerstrom Score			
≤6	26 (24.8%)	79 (75.2%)	105
>6	21 (22.3%)	73 (77.7%)	94
Perceived dependence			
Very	40 (24.8%)	121 (75.2%)	161
Somewhat or not	7 (18.4%)	31 (81.6%)	38
Motivation to quit			
Very motivated	46 (25.1%)	137 (74.9%)	183
Somewhat or not	1 (6.7%)	15 (93.8%)	16
Confidence to quit			
Very confident	35 (25.9%)	100 (74.1%)	135
Somewhat or not	12 (19.0%)	51 (81.0%)	63
Diagnosis			
Smoking-associated cancera	25 (28.4%)	63 (71.6%)	88
Other cancersb	21 (19.1%)	89 (80.9%)	110
Treatment received			
Counseling	6 (17.1%)	29 (82.9%)	35
NRT	14 (23.0%)	47 (77.0%)	61
Bupropion±NRT	8 (25.8%)	23 (74.2%)	31
Varenicline±NRT	19 (26.4%)	53 (73.6%)	72

*p value<0.05

(versus failure to abstain or missing information regarding abstinence status). The results of the cross-tabulations are presented in Table 2 for three-month abstinence. Across the variables measured, three were significantly associated with abstinence at three months: older patients were more likely to abstain than younger ones (p=0.016); married patients were more likely to abstain than non-married or single patients (p=0.05); and patients presenting with lower baseline CO levels were more likely to abstain than those presenting with a higher level of CO (p=0.01). With regards to ARs across pharmacotherapies used, comparable rates of abstinence were observed across groups, with a lower proportion of abstinent patients within the counseling only group (this did not reach statistical significance).

Due to the lower number of abstainers at six months and 12 months, cross-tabulations are not presented. Chi-square and Fisher's exact tests were performed

Table 3. Multivariable Logistic Regression Results for Predictors of Abstinence from Smoking at Three Months

Variable	Odds ratio	p value
Age*	1.04	0.05
Being male	1.09	0.88
Being married	1.08	0.92
Having a smoking associated diagnosis	1.29	0.58
Education		
Less than high school level	Reference	
High school	0.98	0.96
College/university	0.82	0.76
Other	1.62	0.47
Reported monthly income		
<200 JD	Reference	
200-500 JD	2.88	0.07
501-1000 JD*	5.49	0.01
>1000 JD	4.48	0.1
Number of cigarettes per day		
20 to 30	Reference	
21 to 30	1.44	0.6
31 or more	2.17	0.3
Previous attempts to quit		
Never attempted	Reference	
Once or twice	1.07	0.9
Several times	0.98	0.96
Started smoking after the age of 20 years**	0.84	0.72
Being very dependent on tobacco*,***	3.48	0.04
Being very motivated to quit***	8.69	0.07
Being very confident in quitting***	2.02	0.15
Having a CO of 10 ppm or less*	3.00	0.02
Having a Fragerstrom score greater than 6	0.51	0.2
Medication		
None	Reference	
NRTs	3.02	0.1
Oral agents (bupropion or varenicline)	2.78	0.1

*p value<0.05; **versus before; ***versus somewhat or not

to determine associations of clinical and demographic variables with six-month and 12-month abstinence, and only lower CO levels and higher monthly income were found to be associated with abstinence at either six or 12 months.

Table 3 presents the results of the multivariable logistic regression of abstinence at three months. Controlling for all other factors, lower CO levels and being older continued to be significant predictors of abstinence at three months. Furthermore, a higher income (relative to the lowest income group) and reporting severe dependence (relative to dependence reported as 'somewhat' or 'not') were significant predictors of higher odds of abstinence at three months at the multivariable level.

Figure 1 shows reasons for failure to abstain at three months according to the patients' own perception. The most common reason reported by patients who failed and reported a reason was not being able to handle withdrawal (32.4%), no value seen in quitting (19.6%), and feeling down (14.7%). While those who failed to abstain at three-months most frequently cited not being able to handle withdrawal as the reason for failure, those who were able to abstain beyond three months and then failed most frequently reported work or personal stress as the reason they began smoking again.

Finally, drug-related side effects also were reported: 21 patients from the 165 patients in our sample who used smoking cessation medications (i.e. 10.4%) reported some side effects, the most common of which was nausea (14

patients, 8.5%, reported this). Other reported side effects included sleeping disturbances (3.6%), dizziness (2.4%), and dry mouth (1.8%). Of the 21 patients reporting medication side effects, 13 were using varenicline (\pm NRT), two had used bupropion (\pm NRT), and six were using only NRTs.

Discussion

Our study comes as a follow-up to a previously published study examining one-year ARs among cancer patients receiving TDT at a cancer center in Amman, Jordan. In our previous study (Hawari et al., 2012), the one-year AR in all smokers visiting our clinic was 21.2%, largely driven by relatively high ARs in light smokers (44.4%, versus 2% and 0% in medium to heavy smokers, respectively). It is therefore not surprising that our three-month ARs in medium to heavy smokers only reached 23.4%, with only 6% of our initial sample remaining abstinent at one-year. Our results highlight the challenging nature of treating medium to heavy smokers in our settings, and underscore the need for continued follow-up of smokers, given the substantial drop in abstinence beyond the three-month endpoint.

With regards to the absolute value of the overall AR observed in this analysis, the rates observed for our patients were generally lower than ARs that have been reported in the literature covering the general population (Hughes et al., 2007; Stead et al., 2008; Cahill et al., 2012; Stead and Lancaster, 2012), particularly when considering that most of our patients received some pharmacotherapy for TDT. ARs specific to cancer patients have been reported but have varied in the measures of abstinence used and interventions applied to patients. Thus, a wide range of ARs has been reported in the literature (for example, reported six-month abstinence rates have varied from roughly 12-45% (Sanderson Cox et al., 2002; Schnoll et al., 2003; Blalock et al., 2011); and one-year ARs have varied roughly from 13-63% (Gritz et al., 1993; Gritz et al., 1999; Schnoll et al., 2003; Walker et al., 2006).

When considering the relatively lower ARs we observe in comparison to non-cancer populations being treated for tobacco dependence, various factors may be driving these rates: Based on anecdotal clinical observation, the management of patients in our SCC may require reconsideration of the conventional treatment durations and dosages. Patients visiting the clinic sometimes find it difficult to quit completely even while on therapy, and signs of progression in TDT may be seen only after weeks of intensive management. In such cases, shifting the observation window beyond three months to observe "short" term abstinence may be more realistic. It is also important to note that conventional pharmacotherapeutic treatment durations in some cases visiting the clinic have been extended in order to improve symptom control. While this is not the norm, it may be warranted more frequently in our patients. Longer treatment durations of up to six months are mentioned in available guidelines, and clinical data exist to support the safety of such treatment extensions (Fiore et al., 2008). In fact, the development of cancer-specific TDT guidelines has been suggested rather

than apply guidelines designed for the general population (National Cancer Institute, Bethesda, MD). Our results also support the need for more aggressive counseling (e.g. more frequent follow-up visits) in order to address dropping ARs with time in our patients.

In addition, it is important to note that the low ARs we observe are likely compounded by the challenging nature of tobacco control in Jordan: widespread cigarette and waterpipe use continues to be the norm, and exposure of our patients to secondhand smoke in personal, social and public settings is an inevitable problem with almost all our patients. The positive effect of controlling SHS on smokers' ability to quit and maintain their abstinence has been documented (Gilpin et al., 2009). It is therefore likely that the lack of such controls in Jordanian communities contributes detrimentally to poorer ARs in our patient sample.

In our analysis, we also examined possible factors associated with abstinence. Other studies that have examined predictors of smoking relapse have varied in their conclusions regarding predictors of smoking relapse: for example, variables such as smoking frequency at baseline, extent of nicotine dependence, greater fear of disease recurrence, lower perceived risk of disease, lower self-efficacy, higher anxiety and craving during withdrawal, shorter quit duration prior to treatment for cancer, lower income, and younger age of initiation, have been shown to be associated with lower likelihood of quitting (Simmons et al., 2013; Gritz et al., 1999; Schnoll et al., 2003; Walker et al., 2006). These studies have varied in their methods of measurements of potential factors that can influence smoking cessation, thus making comparisons between studies difficult. Our results showed that older age and lower baseline CO levels were significant predictors of abstinence at three months both in bivariate and multivariable analyses. In addition, multivariable analysis revealed that being in one of the higher income groups (relative to the lowest income group) and having a perceived severe dependence on nicotine (relative to perceived dependence of somewhat or not dependent) were significant predictors of abstinence at three months. With regards to the latter, in our sample of patients, perceived severity may have reflected smokers' perceived seriousness of their condition and may in turn have pushed them to make more serious efforts to maintain their abstinence status. While the multivariable effect of income on odds of abstinence was not consistent across all the higher income categories, our results suggest that an income effect consistent in direction with that found in the literature does exist.

Finally, we examined reasons for failure to abstain in our study. At three months, the most commonly reported reason for failure to abstain was not being able to handle withdrawal symptoms followed by seeing no value in quitting; at six months and one year, failure to abstain was most commonly due to facing a stressful personal or professional situation (other reasons cited for patients who failed to abstain at six months included seeing no value in quitting). Our results may be due to the fact that at the start of TDT, the acute symptoms of withdrawal are the more prominent challenge for smokers, while with

time, as withdrawal symptoms abate, other externalities come into play. Furthermore, given the psychologically traumatic nature of patients' disease (cancer), patients feel that tobacco-related damage has already been done and quitting has no value. These results are relevant to note when considering the content of counseling sessions and how it should evolve progressively as the nature of challenges faced by the smoker change.

The relatively small size of our analytic sample, particularly within sub-groups, likely contributed to limited significant findings when attempting to ascertain which factors influenced successful abstinence. Thus, larger studies will be needed to better quantify the impact of patient characteristics and pharmacological agents used, on smoking cessation outcomes in our cancer patients. However, the results of the study provide insight with regards to abstinence outcomes in a unique oncology practice setting, and can be of value for practitioners in comparable settings in the region.

In conclusion, a sample of medium to heavy smokers being treated for cancer in Jordan and receiving smoking cessation treatment, ARs were found to be relatively low in comparison to the literature, and further declined with time. Our results underscore the need for more aggressive patient management and rigorous follow-up during and after smoking cessation treatment particularly when this takes place in challenging settings. Reasons for failure to abstain in the short versus the long-term should be used to tailor counseling practices and better assist smokers.

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