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Primary healthcare clinics in Jordan: shortcomings in cancer prevention and community health

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Abstract

Introduction: Primary healthcare practitioners (PHCPs) can contribute to the control of cancer by promoting healthy lifestyles to patients. Given the scarcity of data in the Middle East on this subject, we sought to determine, through a cross-sectional survey, the status of healthy lifestyle promotion by PHCPs (physicians, nurses, midwives, nurse aids) in Jordan.

Methods: Building on published studies, an Arabic questionnaire was developed to measure knowledge, perceptions and practices of Jordanian PHCPs with regards to healthy lifestyle counseling. A purposive sample of 20 clinics covering the main regions of Jordan were selected and all PHCPs asked to complete the questionnaire.

Results: 322 practitioners (32.3% physicians) responded (75.1% response). 24.4% of PHCPs were current cigarette smokers (physicians, 44.2%). Roughly 58% of physicians and 50% of nonphysicians reported advising the majority of patients to quit tobacco, but proportions were lower for providing other services (e.g. asking about frequency of tobacco use, inquiring about diet and exercise, providing evidence-based guidance on quitting tobacco or improving diet and activity). Only 8% of the sample reported collectively asking – to the majority of patients – about smoking status, exercise, and diet; and providing evidence-based tips to improve these. Among physicians and nonphysicians, 14.2% and 40.4% were able to identify the lifestyle-related risk factors associated with breast, colorectal and lung cancer. In multivariable analyses, confidence was the only significant variable associated with provision of counseling on healthy lifestyles.

Conclusion: Among Jordanian PHCPs, primary prevention services are under-provided, and data suggest ample room to improve PHCPs' skills and practices.

Key words: cancer, prevention, primary care

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Strengths and limitations of this study

- To our knowledge, no other study has been publicly availed with regards to the level of preparedness of primary healthcare practitioners in Jordan to provide cancer prevention counseling to patients.
- The employed survey covered several lifestyle-related counseling practices rather than focusing on one only, under the premise that any primary healthcare practitioner should be well-versed with all lifestyle-related factors.
- The study covered primary healthcare clinics from across the country in Jordan.
- The study was cross-sectional in nature and not powered to conduct in-depth stratified analyses.
- Possible factors influencing the provision of healthy lifestyle-related services are numerous, and an in-depth analysis of these factors was beyond the scope of the analysis.

Introduction

The growing burden of noncommunicable disease (NCD) is a challenge being faced by most countries and has moved leading health organizations to reiterate the importance of disease prevention through healthy lifestyles.[1,2] Cancer in particular, owing to the dramatic health and economic toll it exerts on afflicted patients, necessitates serious efforts to promote lifestyles that lower the risk of this NCD.[3,4] One recommended strategy is through healthy lifestyle promotion (to patients) by healthcare practitioners.[2,5] Primary healthcare practitioners (PHCPs) in particular are acknowledged to be an effective tool for healthy lifestyle promotion,[6-9] and are in a key position to play a highly valuable role in cancer prevention.[4,10] Despite the clear importance of PHCPs engaging in NCD prevention, they face barriers and have yet to realize their full potential in delivering such basic and essential services.[11,12]

In the Middle East, countries struggle to address the rising NCD and cancer burden amidst environments of resource constraints and political unrest.[13,14] A country of a largely young population, Jordan faces further challenges in the advent of its population ageing.[15] To add to these challenges, Jordan's lay public appears to be regressing with regards to lifestyle: tobacco use is increasing (with most recent estimates being 32.3%),[16] and only 27% of the population reports being physically active.[17] It is thus not surprising that the three most commonly occurring cancers in the country, breast, colorectal and lung,[18] are associated at least in part with unhealthy lifestyle practices. Mounting evidence also indicates that the public in Jordan are under-informed with regards to cancer prevention and risks.[17,19-21]. However, if the public is to become better informed, healthcare providers must also be at the forefront to address this matter: the majority of the public prefers to obtain its cancer knowledge through healthcare providers (rather than other information-seeking channels).[17]

Models have been put forth with regards to what healthy lifestyle counseling should entail,[5] and studies have explored the viability of NCD prevention through PHCPs.[12] However, there are limited data specific to the region's PHCPs. We sought to study a Middle Eastern healthcare system that represents a country and region which faces various challenges that are likely to hinder the provision of NCD and cancer prevention services. Specifically, we sought to assess practices and perceptions among PHCPs in Jordan's largest public healthcare (Ministry of Health) clinics with regards to cancer prevention through healthy lifestyle counseling, thereby providing much-needed insight to inform interventions that promote cancer (and other NCDs) prevention. In addition, research generated in Jordan can also be useful for other neighboring countries with similar sociopolitical challenges.

Methods

Ethical review: The study was reviewed and approved by the Institutional Review Board at King Hussein Cancer Center (KHCC, the only comprehensive national cancer treatment facility in Jordan).

Setting and sample: A purposive sample of clinics representing the different types of public primary healthcare clinics in Jordan and covering the three main regions of the country (North, Central, South) were selected by the Jordanian Ministry of Health. Throughout February and March of 2014, all active PHCPs (i.e. physicians, nurses, midwives and nurse aids) in each clinic visited were asked to complete the questionnaire.

Questionnaire: The self-administered Arabic questionnaire was developed using the Social Cognitive Theory (SCT) as a guiding framework.[22] Other studies which evaluated professional practices in the area of healthy lifestyle counseling and cancer screening also were reviewed.[23-29]

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However, the a substantial part of the final tested questionnaire was customized to the local primary healthcare environment, covering key practices that were feasible and of relevance to promote among Jordanian PHCPs.

Content validity for the questionnaire was ensured by reviewing it with physicians and allied health staff working in the Jordanian Ministry of Health as well as King Hussein Cancer Center; and the tool was piloted in one primary healthcare clinic. The Cronbach's alpha of the questionnaire was 0.80.

The final questionnaire consisted of two main components: provider-reported knowledge, attitudes and practices pertaining to cancer-related healthy lifestyle counseling (tobacco use, healthy diet, physical activity); and provider-reported knowledge, attitudes and practices pertaining to counseling on the perceived burden and early signs and symptoms of the most prevalent cancers in Jordan: breast, colorectal and lung cancers. The latter component is beyond the scope of the current analysis, and descriptions of the sections covering only the former component are therefore included below.

- Practices: we measured the extent to which various actions (asking about each lifestyle factor, explaining the factor's association with cancer, and providing evidence-based recommendations on how to improve or perform each factor) were performed for adults visiting the clinic. Specific lifestyle factors focused on included healthy diet, physical activity, obesity and smoking. Practitioners were asked to estimate the percentage of patients 18 or older for whom the actions were performed on in the past two months. Responses to these variables were further categorized during analysis (whether or not each activity was performed for the majority – 70% or more – of adult patients seen). Given our interest in ultimately promoting the provision of healthy lifestyle counseling to the majority of patients in a comprehensive manner (i.e. encompassing smoking, diet, physical activity and obesity), we also defined a compound variable of overall provision of healthy lifestyle counseling by observing the proportion of practitioners who reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in 70% or more of patients.
- Level of agreement (on a five-point scale) with statements covering the provision of healthy lifestyle counseling: the questionnaire specifically gauged the perceived value of healthy lifestyle counseling, negative and positive outcomes of such counseling; need for counseling; perceived professional responsibility to provide counseling; and the need for training in this area. Responses to these variables were further categorized during analysis (for each attitudinal statement, whether or not respondents had an unfavorable perception that could deter from provision of healthy lifestyle counseling).
- Perceived confidence (on a five point scale) to ask about each lifestyle factor, explain the factor's association with cancer, and provide evidence-based recommendations on how to improve or perform each factor: responses to these variables were dichotomized during analysis (confident or highly confident, versus all other responses). A dummy variable also was created to reflect whether or not practitioners concurrently reported confidence to provide several activities.
- A general section probing barriers to counseling patients on cancer prevention and early detection was included. Various factors (practitioner-related; patient-related; system-related) were listed and practitioners rated each according to level of significance (major barrier; moderate barrier; not a barrier).
- Knowledge with regards to the effect of lifestyle factors on risk of incidence of breast, colorectal and lung cancers (increases risk, decreases risk, no effect, don't know). A dummy variable also was created to reflect whether or not practitioners were able to

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concurrently identify lifestyle-related risk factors associated with each of the three cancer sites probed.
- A section measuring practitioners' demographic and professional characteristics.

Statistical Analysis: Descriptive statistics were generated to present the characteristics of the sample and the attitudes, practices and knowledge levels of practitioners with regards to various elements of cancer prevention through healthy lifestyle counseling. Descriptive statistics were further analyzed in a bivariate manner for physicians and nonphysicians, since this particular factor was of practical relevance in informing recommendations for future training efforts (i.e. whether or not they may need to be tailored to profession).

All analyses were performed using STATA SE 12.1.

Multivariate logistic regressions were run to assess the possible demographic, professional, attitudinal and knowledge factors that were associated with providing specific actions (for example, asking about and providing evidence-based recommendations for healthy eating; asking about and providing evidence-based recommendations for exercise; and asking about providing evidence-based recommendations to stop smoking). Independent variables explored in the models included gender, age, being a physician, whether or not the respondent engaged in a healthy lifestyle (exercised regularly during the week, ate fruits and legumes regularly during the week, did not eat red meat or fast foods frequently during the week), whether or not the respondent valued healthy lifestyle counseling, knowledge of the lifestyle factor's effect on risk of cancer, and confidence in providing the action.

Results

Sample characteristics: A total of 322 practitioners (218 nurses, midwives and nurse aids; 104 physicians) across 20 clinics in the North (8 clinics), Central (9 clinics) and South (3 clinics) regions of Jordan responded to the survey (75.1% response rate). The sample had a larger proportion of nonphysicians and females than physicians and males, respectively (Table 1).

With regards to lifestyle practices, 24.4% of the sample were current cigarette smokers (with physicians, who were largely male, having a smoking rate of 44.2%); 14.8% were current waterpipe smokers. Unhealthy lifestyle practices were decipherable, most noticeably the low reported rates of regular physical activity.

Current practices: Reported frequencies of various activities related to counseling on healthy lifestyles are included in Figure 1. The most frequently reported activity was advising tobacco users to quit: approximately 58% of physicians and 50% of nonphysician PHCPs reported doing this with the majority of their patients. However, less than half of practitioners reported providing to the majority of their adult patients other key services such as asking about the frequency of tobacco use, inquiring about dietary and exercise habits, and providing patients with evidence-based guidance with regards to quitting tobacco and improving their diet and physical activity. When the concurrent provision of practices were observed, rates of provision dropped further: roughly 8% of the sample reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in the majority of patients.

Perceptions: Table 2 lists various statements which practitioners were asked to express their level of agreement with, and the proportions of respondents with perceptions that may deter from provision of healthy lifestyle counseling. With the exception of a few statements, results were comparable between physicians and nonphysicians. A substantial (61.7%) proportion of practitioners felt patients were sufficiently knowledgeable (and not in need of education) with

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regards to smoking's association with cancer, while approximately 41% and 38% felt similarly with regards to patient's knowledge and need of education on the diet-cancer and physical activity-cancer association (respectively). With regards to outcome expectancies, 45.5% of practitioners did not perceive that their smoking cessation advise would increase the likelihood of a patient quitting, while roughly 37% and 30% did not perceive their advice would influence the likelihood of patients improving their exercise habits or dietary ones, respectively. Furthermore, 40.5% of respondents did not reject the statement that lifestyle counseling would bother patients, and 36.5% were unable to reject the statement that counseling made them feel uncomfortable. In addition, 61.6% of practitioners did not reject the suggestion that 'counseling on prevention of other noncommunicable diseases is more important than counseling on cancer prevention'. Finally, variability was observed with regards to which PHCP (nurse or physician) should be responsible for healthy lifestyle counseling.

When probed with regards to confidence (Table 3), lower proportions of nonphysicians tended to report being confident across the healthy lifestyle counseling tasks listed. Relatively low proportions (not exceeding 55%) of all practitioners reported high confidence in documentation of tobacco use and frequency; and relatively lower proportions of practitioners reported confidence in explaining the effects of specific lifestyle factors such as obesity and diet on the risk of cancer.

Knowledge: When analyzing knowledge of lifestyle factors and whether or not they influenced the risk of breast, colorectal and lung cancers, high levels of knowledge were observed with roughly no less than 70% of practitioners identifying individual risk factors per cancer site appropriately (with the exception of red meat and high fiber diet and colorectal cancer risk: low levels of knowledge with regards to these factors were driven by the substantially lower proportion of nonphysicians who did not know the association of these dietary staples with cancer). When a compound variable reflecting whether or not practitioners were able to identify lifestyle-related risk factors associated with each of the three cancer sites probed, lower proportions of practitioners could do so (14.2% of nonphysicians and 40.4% of physicians).

Barriers: The most frequently reported barriers to the provision of healthy lifestyle counseling were largely patient related. These included 'patients do not want to quit smoking', 'low literacy of patients', 'patients do not want to make dietary changes', 'patients scared or bothered if cancer is discussed', and 'patients cannot access healthy food'.

Multivariable analysis: Multivariable logistic regression analyses were conducted to assess the association of various factors with the provision of healthy lifestyle counseling. Across models run to predict correlates of asking about and providing evidence-based recommendations on healthy lifestyle factors, confidence was the only significant independent variable. For example, those reporting confidence in asking about and providing recommendations for a healthy lifestyle (healthy diet, exercise, and smoking cessation) were 30% more likely to engage in these activities than those who did not report such confidence. Those reporting confidence in asking about smoking status, advising quitting, and providing recommendations for quitting, were roughly twice as likely to engage in these activities than those who did not.

Discussion

Equipped and knowledgeable PHCPs can be a key and cost-effective resource for counseling on and contributing to the prevention of cancer and other NCDs. Despite this long-standing fact, the findings of our study confirm, in governmental primary care clinics in Jordan, the under-provision of various activities related to healthy lifestyle counseling; and the existence of knowledge gaps and misperceptions that can deter from such counseling within the primary

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healthcare setting. Our findings, based on a sample of clinics representing the three main geographic areas of the country, shed light on an under-studied practitioner population existing in a developing region (and serving a significant segment of the country's host population as well as incoming refugees from surrounding areas). Thus, the findings can provide the impetus to avail and inform interventions to improve practitioner perceptions, knowledge, and practices in this area of the world.

With regards to the current status of healthy lifestyle counseling, there was an under-provision of various important aspects of healthy lifestyle counseling. Only advising cigarette smokers to quit was estimated to have been provided to roughly half of patients seen. When we combined counseling activities, as exemplified by the proportion of practitioners who reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in the majority of patients, it was evident that there was a dramatic under-provision of comprehensive lifestyle counseling. Relatedly, individual traits existed which could negatively influence the likelihood that PHCPs would engage in healthy lifestyle counseling. Our sample of PHCPs generally did not engage in regular physical activity, did not (in high proportions) follow a healthy diet, and a substantial proportion of physicians (44.2%) were cigarette smokers.

With regards to perceptions, many practitioners believed that patients already knew enough about lifestyle factors such as smoking and did not need further counseling. Furthermore, patient-stemming barriers (as a result of patient attitudes, illiteracy) were the most frequently cited impediments to the provision of counseling. Many of the practitioners in our sample also did not perceive that their counseling would increase the likelihood that a patient changes their behavior. Finally, while knowledge about individual lifestyle factors and their association with cancer was generally high, knowledge levels were substantially lower when examining indicators of comprehensive (in the context of the lifestyle factors and cancers we probed) knowledge.

The determinants of healthy lifestyle counseling by practitioners vary in the literature and include, at the level of the practitioner, age, gender, specialty, extent of training, identifying a lifestyle related risk factor in a patient, practicing the health habit counseled on, reporting confidence to counsel, and perceiving value in the practice.[23,29-32] Our multivariable analyses only revealed self-efficacy as a consistent significant predictor of provision of healthy lifestyle counseling. Self-efficacy, however, is multifaceted, playing an intricate role in determining health behavior both by directly influencing that behavior, and by influencing (and being influenced by) various attitudes and individual characteristics that also influence the performance of the behavior.[22] Our results provide some insight into factors that likely influence self-efficacy, and thus provide various discussion and educational points for inclusion in interventions (such as training) that can improve the self-efficacy of PHCPs to provide healthy lifestyle counseling. Differences amongst physicians and nonphysicians that we detected in some results also emphasize the need to address – in any potential intervention – each professional category in a customized manner.

The possible factors influencing the provision of healthy lifestyle-related services are numerous, and span multiple levels and individuals.[12,33,34] Although we could not cover the full scope of these factors, our findings can contribute data and insight to inform the planning of interventions to improve healthy lifestyle counseling through PHCPs in Jordan.

Our study has its limitations. Our survey was a descriptive cross-sectional one and relied on the use of a tool that had not been previously validated (we designed the tool for the specific purpose of the study). Although our results indicate that the tool was reliable, our results should be interpreted with this in mind. In addition, we were not able to verify the practitioner-reported results with objective measures. Documentation systems in the in the clinics we targeted are

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undeveloped, and we were also unable to conduct patient interviews to verify our findings. Nevertheless, given that our results indicate substantial practice and knowledge gaps – particularly when gauging whether or not providers availed several actions collectively, or could identify all the relevant risk factors for the cancers evaluated – it is unlikely that our findings or conclusions would have differed in direction had we supplemented our data with more objective measures. Furthermore, although we highlight the strong association of reported confidence with providing counseling on cancer prevention through healthy lifestyles, our intension was not to identify causal factors. Confidence is likely to have been shaped by other overlapping factors such as skills, knowledge and perceptions with regards to the value of counseling. Determining these intricate connections was beyond the scope of our study. Finally with regards to limitations, we were constrained with a purposive sample of 20 clinics. However, we were able to confirm through ad hoc power analyses that our study was sufficiently powered to detect various estimates.

Despite our limitations, we were able to study a sample of clinics that covered the main governorates in the country, and benefited from a relatively high response rate. Our findings indicate that, among Jordanian PHCPs in governmental healthcare clinics, primary cancer prevention services through healthy lifestyle counseling are under-provided. Our data also suggest that there is ample room for improving PHCPs' skills and practices.

Contributorship statement:

1. Nour Obeidat contributed to the planning, conduct, data processing and analysis, manuscript development, and final manuscript review.
2. Malek Habashneh contributed to the planning, conduct, manuscript development, and final manuscript review.
3. Rawan Shihab contributed to the conduct, data processing, manuscript development, and final manuscript review.
4. Feras Hawari contributed to the planning, manuscript development, and final manuscript review.

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Table 1. Demographic, professional and lifestyle characteristics of sample of primary care physicians and nurses across Jordan

	Nurses/assistants, midwives (n=218)	Physicians (n=104)
Mean age (range)	35.4 (22 – 55)	42.7 (25 – 64)
Mean years since graduating with highest professional degree (range)	13.5 (1 – 35)	16.3 (1 – 34)
Female n (%)	180 (85.3%)	28 (27.7%)
Currently smoke cigarette n (%)	35 (16.2%)	46 (44.2%)
Currently smoke waterpipe n (%)	29 (13.6%)	19 (18.3%)
Mean BMI (range)	26.8 (16.5 – 77.8)	25.8 (19.1 – 32.8)
Exercise regularly n (%)	26 (12.1%)	21 (20.8%)
Ate legumes on 6 or more days of week n (%)	33 (15.5%)	28 (27.7%)
Ate fruits on 6 or more days of week n (%)	45 (21.1%)	40 (39.2%)
Ate red meat on 3 or more days of week n (%)	76 (36.0%)	54 (52.9%)
Ate fast food on 3 or more days of week n (%)	43 (20.1%)	17 (16.5%)

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See attached image.

Figure 1. Average proportions of primary care providers' in clinics in Jordan (physicians versus nonphysicians) who reported performing various lifestyle-related counseling activities in atleast 70% of adult patients (over 18) they saw; *Significant chi square statistic (p-value<0.05) when comparing physicians to nonphysicians*

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Table 2. Attitudes regarding healthy lifestyle counseling and cancer prevention among practitioners in primary healthcare clinics in Jordan

Statement	Non-physicians	Physicians
Proportion disagreeing/neutral that "preventing cancer is possible" (n=320)*	72 (33.3%)	23 (22.6%)
Proportion agreeing/neutral that "most patients aware of smoking-cancer relation, do not need more information" (n=314)	129 (60.9%)	65 (65.0%)
Proportion agreeing/neutral that "most patients aware of diet-cancer relation, do not need more information" (n=318)	92 (43.2%)	37 (35.9%)
Proportion agreeing/neutral that "most patients aware of exercise-cancer relation, do not need more information" (n=316)	84 (39.8%)	36 (35.0%)
Proportion disagreeing/neutral that "smoking is a medical condition needing treatment" (n=316)	36 (16.8%)	18 (18.0%)
Proportion disagreeing/neutral that "obesity is a medical condition needing treatment" (n=317)	19 (9.0%)	6 (5.8%)
Proportion disagreeing/neutral that they are "bothered when seeing effects of unhealthy lifestyles on patients" (n=310)	35 (16.8%)	14 (14.0%)
Proportion disagreeing/neutral that "likelihood that patient quits smoking increases if I advise him/her to do so" (n=314)	90 (42.7%)	53 (52.5%)
Proportion disagreeing/neutral that "likelihood that patient follows healthy diet increases if I advise him/her to do so" (n=311)	66 (31.4%)	28 (28.3%)
Proportion disagreeing/neutral that "likelihood that patient exercises increases if I advise him/her to do so" (n=313)	77 (37.0%)	39 (37.9%)
Proportion agreeing/neutral that "counseling on prevention of non-communicable diseases (like diabetes and hypertensions) is more important than counseling on prevention of cancer" (n=318)	131 (60.7%)	65 (65.0%)
Proportion disagreeing/neutral that "physicians in clinic should be trained to provide counseling on healthy lifestyle practices" (n=317)	22 (10.3%)	16 (15.7%)
Proportion disagreeing/neutral that "nonphysicians staff in the clinic should be trained to provide counseling on healthy lifestyle practices" (n=321)	24 (11.1%)	9 (8.7%)
Proportion agreeing/neutral that "most patients won't take advice with regards to healthy lifestyle practices seriously" (n=311)	151 (72.3%)	66 (66.0%)
Proportion disagreeing/neutral they "feel more confident counseling patients on healthy lifestyle practices they successfully engage in themselves" (n=321)	29 (13.5%)	8 (7.7%)
Proportion agreeing/neutral they "prefer counseling only patients who they feel will listen to them on healthy lifestyle practices" (n=320)	130 (60.5%)	59 (57.3%)
Proportion disagreeing/neutral that "counseling patients on healthy lifestyle practices gives a feeling of self-respect and self-satisfaction" (n=322)	33 (15.2%)	11 (10.7%)
Proportion agreeing/neutral that "talking about healthy lifestyle practices bothers patients and negatively impacts relationship with them" (n=311)	84 (40.2%)	42 (42.0%)
Proportion agreeing/neutral that "they feel uncomfortable talking about healthy lifestyle practices with patients" (n=318)	81 (37.9%)	35 (34.3%)
Proportion disagreeing/neutral that "patients will change their lifestyle practices for the better if counseled on healthy lifestyle practices" (n=316)	48 (22.8%)	29 (28.2%)
Proportion disagreeing/neutral that their "counseling on healthy lifestyle practices will lower patients' risk of cancer" (n=322)	72 (33.3%)	30 (28.9%)
Proportion disagreeing/neutral that their "counseling on healthy lifestyles will improve patient care" (n=319)*	34 (15.7%)	7 (6.9%)
Proportion disagreeing/neutral that "counseling on healthy lifestyles should be physician's role" (n=322)*	95 (44.2%)	62 (59.6%)
Proportion disagreeing/neutral that "counseling on healthy lifestyles should be nurse's role" (n=321)*	84 (38.9%)	26 (25.0%)

Significant chi square statistic when comparing physicians to nonphysicians (p-value<0.05)

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Table 3. Proportions of practitioners reporting confidence in providing various healthy lifestyle counseling activities within primary healthcare clinics in Jordan

	N (%) nonphysicains	N (%) physicians
Ask about amount and frequency of cigarette or waterpipe use*	119 (55.1%)	70 (70.0%)
Document amount and frequency of cigarette or waterpipe use	98 (46.0%)	54 (54.6%)
Explain effect of smoking on risk of incidence of different cancers*	131 (61.8%)	79 (79.0%)
Advise cigarette smoker to quit*	139 (65.9%)	78 (77.2%)
Advise waterpipe smoker to quit*	134 (63.5%)	75 (78.1%)
Ask patient about his/her dietary habits	139 (65.6%)	66 (68.0%)
Ask patient about his/her physical activity	130 (63.7%)	68 (69.4%)
Explain effect of diet on risk of incidence of different cancers	107 (49.8%)	61 (60.4%)
Explain effect of physical activity on risk of incidence of different cancers*	117 (54.4%)	69 (68.3%)
Explain effect of obesity on risk of incidence of different cancers *	103 (48.1%)	61 (60.4%)
Give patient evidence-based recommendations to improve his/her dietary habits *	125 (59.0%)	75 (74.3%)
Give patient evidence-based recommendations to improve his/her activity*	120 (56.1%)	75 (72.8%)
Give patient evidence-based recommendations on quitting smoking	143 (66.5%)	72 (72.0%)
Reporting confidence in all the above-listed activities*	24 (11.0%)	21 (20.2%)

Significant chi square statistic when comparing physicians to nonphysicians (p-value<0.05)

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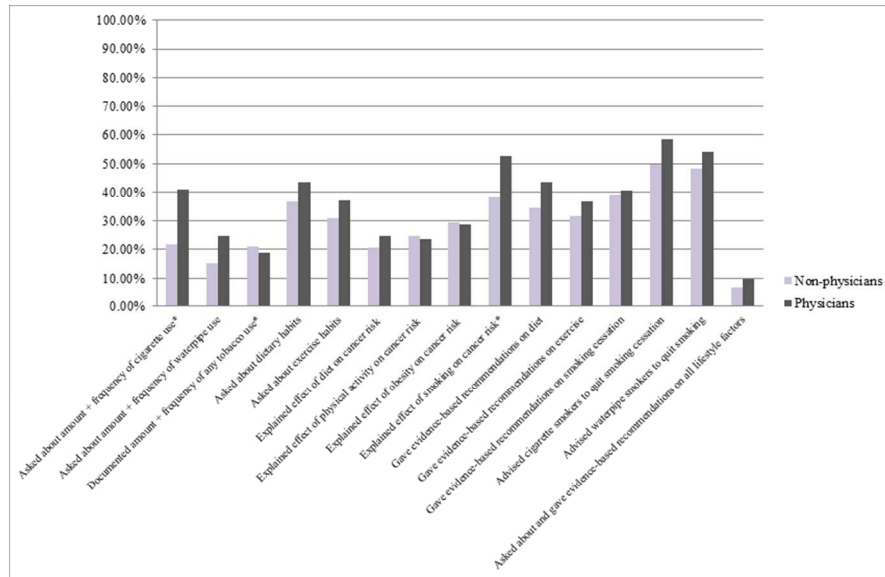51
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Figure 1. Average proportions of primary care providers' in clinics in Jordan (physicians versus nonphysicians) who reported performing various lifestyle-related counseling activities in atleast 70% of adult patients (over 18) they saw; *Significant chi square statistic (p-value<0.05) when comparing physicians to nonphysicians

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page in manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give eligibility criteria, and the sources and methods of selection of participants	4
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5-6
		(*b*) Describe any methods used to examine subgroups and interactions	

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(*c*) Explain how missing data were addressed

(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed

Case-control study—If applicable, explain how matching of cases and controls was addressed

Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy

(*e*) Describe any sensitivity analyses

Results

	Item No	Recommendation	Page in manuscript
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	6-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-7
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	

Discussion

Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	7
Interpretation	20	Give a cautious overall interpretation of results considering	7

objectives, limitations, multiplicity of analyses, results from
similar studies, and other relevant evidence

Generalisability	21	Discuss the generalisability (external validity) of the study results	7

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Are Jordanian primary healthcare practitioners fulfilling their potential in cancer prevention and community health? Findings from a cross-sectional survey.

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Are Jordanian primary healthcare practitioners fulfilling their potential in cancer prevention and community health? Findings from a cross-sectional survey.

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Abstract

Introduction: Primary healthcare practitioners (PHCPs) can contribute to the control of cancer by promoting healthy lifestyles to patients. Given the scarcity of data in the Middle East on this subject, we sought to determine, through a cross-sectional survey, the status of healthy lifestyle promotion by PHCPs (physicians, nurses, midwives, nurse aids) in Jordan.

Methods: Building on published studies, an Arabic questionnaire was developed to measure knowledge, perceptions and practices of Jordanian PHCPs with regards to healthy lifestyle counseling. A purposive sample of 20 clinics covering the main regions of Jordan were selected and all PHCPs asked to complete the questionnaire.

Results: 322 practitioners (32.3% physicians) responded (75.1% response rate). 24.4% of PHCPs were current cigarette smokers (physicians, 44.2%). Roughly 58% of physicians and 50% of nonphysicians reported advising the majority of patients to quit tobacco, but proportions were lower for providing other services (e.g. asking about frequency of tobacco use, inquiring about diet and exercise, providing evidence-based guidance on quitting tobacco or improving diet and activity). Only 8% of the sample reported collectively asking – to the majority of patients – about smoking status, exercise, and diet; and providing evidence-based tips to improve these. Among physicians and nonphysicians, 14.2% and 40.4% were able to identify the lifestyle-related risk factors associated with breast, colorectal and lung cancer. In multivariable analyses, confidence was the only significant variable associated with provision of counseling on healthy lifestyles.

Conclusion: Among Jordanian PHCPs, primary prevention services are under-provided, and data suggest ample room to improve PHCPs' skills and practices.

Key words: cancer, prevention, primary care

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Strengths and limitations of this study

- To our knowledge, no other study has been publicly availed with regards to the level of preparedness of primary healthcare practitioners in Jordan to provide cancer prevention counseling to patients.
- The employed survey covered several lifestyle-related counseling practices rather than focusing on one only, under the premise that any primary healthcare practitioner should be well-versed with all lifestyle-related factors.
- The study covered primary healthcare clinics from across the country in Jordan.
- The study was cross-sectional in nature and not powered to conduct in-depth stratified analyses.
- Possible factors influencing the provision of healthy lifestyle-related services are numerous, and an in-depth analysis of these factors was beyond the scope of the analysis.

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Introduction

The growing burden of noncommunicable disease (NCD) is a challenge being faced by most countries and has moved leading health organizations to reiterate the importance of disease prevention through healthy lifestyles.[1,2] Cancer in particular, owing to the dramatic health and economic toll it exerts on afflicted patients, necessitates serious efforts to promote lifestyles that lower the risk of this NCD.[3,4] One recommended strategy is through healthy lifestyle promotion (to patients) by healthcare practitioners.[2,5] Primary healthcare practitioners (PHCPs) in particular are acknowledged to be an effective tool for healthy lifestyle promotion,[6-9] and are in a key position to play a highly valuable role in cancer prevention.[4,10] Despite the clear importance of PHCPs engaging in NCD prevention, they face barriers and have yet to realize their full potential in delivering such basic and essential services.[11,12]

In the Middle East, countries struggle to address the rising NCD and cancer burden amidst environments of resource constraints and political unrest.[13,14] A country of a largely young population, Jordan faces further challenges in the advent of its population ageing.[15] To add to these challenges, Jordan's lay public appears to be regressing with regards to lifestyle: tobacco use is increasing (with most recent estimates being 32.3%),[16] and only 27% of the population reports being physically active.[17] It is thus not surprising that the three most commonly occurring cancers in the country, breast, colorectal and lung,[18] are associated at least in part with unhealthy lifestyle practices. Mounting evidence also indicates that the public in Jordan are under-informed with regards to cancer prevention and risks.[17,19-21]. However, if the public is to become better informed, healthcare providers must also be at the forefront to address this matter: the majority of the public prefers to obtain its cancer knowledge through healthcare providers (rather than other information-seeking channels).[17]

Models have been put forth with regards to what healthy lifestyle counseling should entail,[5] and studies have explored the viability of NCD prevention through PHCPs.[12] However, there are limited data specific to the region's PHCPs. We sought to study a Middle Eastern healthcare system that represents a country and region which faces various challenges that are likely to hinder the provision of NCD and cancer prevention services. Specifically, we sought to assess practices and perceptions among PHCPs in Jordan's largest public healthcare (Ministry of Health) clinics with regards to cancer prevention through healthy lifestyle counseling, thereby providing much-needed insight to inform interventions that promote cancer (and other NCDs) prevention. In addition, research generated in Jordan can also be useful for other neighboring countries with similar sociopolitical challenges.

Methods

Ethical review: The study was reviewed and approved by the Institutional Review Board at King Hussein Cancer Center (KHCC, the only comprehensive national cancer treatment facility in Jordan).

Setting and sample: A purposive sample of clinics representing the different types of public primary healthcare clinics in Jordan and covering the three main regions of the country (North, Central, South) were selected by the Jordanian Ministry of Health. Throughout February and March of 2014, all active PHCPs (i.e. physicians, nurses, midwives and nurse aids) in each clinic visited were asked to complete the questionnaire.

Questionnaire: The self-administered Arabic questionnaire was developed using the Social Cognitive Theory (SCT) as a guiding framework.[22] Other studies which evaluated professional practices in the area of healthy lifestyle counseling and cancer screening also were reviewed.[23-29]

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However, the a substantial part of the final tested questionnaire was customized to the local primary healthcare environment, covering key practices that were feasible and of relevance to promote among Jordanian PHCPs.

Content validity for the questionnaire was ensured by reviewing it with physicians and allied health staff working in the Jordanian Ministry of Health as well as King Hussein Cancer Center; and the tool was piloted in one primary healthcare clinic. The Cronbach's alpha (internal consistency) of the questionnaire was 0.80.

The final questionnaire consisted of two main components: provider-reported knowledge, attitudes and practices pertaining to cancer-related healthy lifestyle counseling (tobacco use, healthy diet, physical activity); and provider-reported knowledge, attitudes and practices pertaining to counseling on the perceived burden and early signs and symptoms of the most prevalent cancers in Jordan: breast, colorectal and lung cancers. The latter component is beyond the scope of the current analysis, and descriptions of the sections covering only the former component are therefore included below.

- Practices: we measured the extent to which various actions (asking about each lifestyle factor, explaining the factor's association with cancer, and providing evidence-based recommendations on how to improve or perform each factor) were performed for adults visiting the clinic. Specific lifestyle factors focused on included healthy diet, physical activity, obesity and smoking. Practitioners were asked to estimate the percentage of patients 18 or older for whom the actions were performed on in the past two months. Responses to these variables were further categorized during analysis (whether or not each activity was performed for the majority – 70% or more – of adult patients seen). Given our interest in ultimately promoting the provision of healthy lifestyle counseling to the majority of patients in a comprehensive manner (i.e. encompassing smoking, diet, physical activity and obesity), we also defined a compound variable of overall provision of healthy lifestyle counseling by observing the proportion of practitioners who reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in 70% or more of patients.
- Level of agreement (on a five-point scale) with statements covering the provision of healthy lifestyle counseling: the questionnaire specifically gauged the perceived value of healthy lifestyle counseling, negative and positive outcomes of such counseling; need for counseling; perceived professional responsibility to provide counseling; and the need for training in this area. Responses to these variables were further categorized during analysis (for each attitudinal statement, whether or not respondents had an unfavorable perception that could deter from provision of healthy lifestyle counseling).
- Perceived confidence (on a five point scale) to ask about each lifestyle factor, explain the factor's association with cancer, and provide evidence-based recommendations on how to improve or perform each factor: responses to these variables were dichotomized during analysis (confident or highly confident, versus all other responses). A dummy variable also was created to reflect whether or not practitioners concurrently reported confidence to provide several activities.
- A general section probing barriers to counseling patients on cancer prevention and early detection was included. Various factors (practitioner-related; patient-related; system-related) were listed and practitioners rated each according to level of significance (major barrier; moderate barrier; not a barrier).
- Knowledge with regards to the effect of lifestyle factors on risk of incidence of breast, colorectal and lung cancers (increases risk, decreases risk, no effect, don't know). A dummy variable also was created to reflect whether or not practitioners were able to

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concurrently identify lifestyle-related risk factors associated with each of the three cancer sites probed.

- A section measuring practitioners' demographic and professional characteristics.

Statistical Analysis: Descriptive statistics were generated to present the characteristics of the sample and the attitudes, practices and knowledge levels of practitioners with regards to various elements of cancer prevention through healthy lifestyle counseling. Descriptive statistics were further analyzed in a bivariate manner for physicians and nonphysicians, since this particular factor was of practical relevance in informing recommendations for future training efforts (i.e. whether or not they may need to be tailored to profession).

All analyses were performed using STATA SE 12.1.

Multivariate logistic regressions were run to assess the possible demographic, professional, attitudinal and knowledge factors that were associated with providing specific actions (for example, asking about and providing evidence-based recommendations for healthy eating; asking about and providing evidence-based recommendations for exercise; and asking about providing evidence-based recommendations to stop smoking). Independent variables explored in the models included gender, age, being a physician, whether or not the respondent engaged in a healthy lifestyle (exercised regularly during the week, ate fruits and legumes regularly during the week, did not eat red meat or fast foods frequently during the week), whether or not the respondent valued healthy lifestyle counseling, knowledge of the lifestyle factor's effect on risk of cancer, and confidence in providing the action.

Results

Sample characteristics: A total of 322 practitioners (218 nurses, midwives and nurse aids; 104 physicians) across 20 clinics in the North (8 clinics), Central (9 clinics) and South (3 clinics) regions of Jordan responded to the survey, resulting in a 75.1% response rate (the response rate was calculated as a percentage of the number of respondents divided by the number of practicing physicians and nurses in the clinics). The sample had a larger proportion of nonphysicians and females than physicians and males, respectively (Table 1).

With regards to lifestyle practices, 24.4% of the sample were current cigarette smokers (with physicians, who were largely male, having a smoking rate of 44.2%); 14.8% were current waterpipe smokers. Unhealthy lifestyle practices were decipherable, most noticeably the low reported rates of regular physical activity.

Current practices: Reported frequencies of various activities related to counseling on healthy lifestyles are included in Figure 1. The most frequently reported activity was advising tobacco users to quit: approximately 58% of physicians and 50% of nonphysician PHCPs reported doing this with the majority of their patients. However, less than half of practitioners reported providing to the majority of their adult patients other key services such as asking about the frequency of tobacco use, inquiring about dietary and exercise habits, and providing patients with evidence-based guidance with regards to quitting tobacco and improving their diet and physical activity. When the concurrent provision of practices were observed, rates of provision dropped further: roughly 8% of the sample reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in the majority of patients.

Perceptions: Table 2 lists various statements which practitioners were asked to express their level of agreement with, and the proportions of respondents with perceptions that may deter from provision of healthy lifestyle counseling. With the exception of a few statements, results were

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comparable between physicians and nonphysicians. A substantial (61.7%) proportion of practitioners felt patients were sufficiently knowledgeable (and not in need of education) with regards to smoking's association with cancer, while approximately 41% and 38% felt similarly with regards to patient's knowledge and need of education on the diet-cancer and physical activity-cancer association (respectively). With regards to outcome expectancies, 45.5% of practitioners did not perceive that their smoking cessation advise would increase the likelihood of a patient quitting, while roughly 37% and 30% did not perceive their advice would influence the likelihood of patients improving their exercise habits or dietary ones, respectively. Furthermore, 40.5% of respondents did not reject the statement that lifestyle counseling would bother patients, and 36.5% were unable to reject the statement that counseling made them feel uncomfortable. In addition, 61.6% of practitioners did not reject the suggestion that 'counseling on prevention of other noncommunicable diseases is more important than counseling on cancer prevention'. Finally, variability was observed with regards to which PHCP (nurse or physician) should be responsible for healthy lifestyle counseling.

When probed with regards to confidence (Table 3), lower proportions of nonphysicians tended to report being confident across the healthy lifestyle counseling tasks listed. Relatively low proportions (not exceeding 55%) of all practitioners reported high confidence in documentation of tobacco use and frequency; and relatively lower proportions of practitioners reported confidence in explaining the effects of specific lifestyle factors such as obesity and diet on the risk of cancer.

Knowledge: When analyzing knowledge of lifestyle factors and whether or not they influenced the risk of breast, colorectal and lung cancers, high levels of knowledge were observed with roughly no less than 70% of practitioners identifying individual risk factors per cancer site appropriately (with the exception of red meat and high fiber diet and colorectal cancer risk: low levels of knowledge with regards to these factors were driven by the substantially lower proportion of nonphysicians who did not know of the association of these dietary staples with cancer). When a compound variable reflecting whether or not practitioners were able to identify lifestyle-related risk factors associated with each of the three cancer sites probed, lower proportions of practitioners could do so (14.2% of nonphysicians and 40.4% of physicians).

Barriers: The most frequently reported barriers to the provision of healthy lifestyle counseling were largely patient related. These included 'patients do not want to quit smoking', 'low literacy of patients', 'patients do not want to make dietary changes', 'patients scared or bothered if cancer is discussed', and 'patients cannot access healthy food'.

Multivariable analysis: Multivariable logistic regression analyses were conducted to assess the association of various factors with the provision of healthy lifestyle counseling. Across models run to predict correlates of asking about and providing evidence-based recommendations on healthy lifestyle factors, confidence was the only significant independent variable. For example, those reporting confidence in asking about and providing recommendations for a healthy lifestyle (healthy diet, exercise, and smoking cessation) were 30% more likely to engage in these activities than those who did not report such confidence. Those reporting confidence in asking about smoking status, advising quitting, and providing recommendations for quitting, were roughly twice as likely to engage in these activities than those who did not.

Discussion

Equipped and knowledgeable PHCPs can be a key and cost-effective resource for counseling on and contributing to the prevention of cancer and other NCDs. Despite this long-standing fact, the findings of our study confirm, in governmental primary care clinics in Jordan, the under-

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provision of various activities related to healthy lifestyle counseling; and the existence of knowledge gaps and misperceptions that can deter from such counseling within the primary healthcare setting. Our findings, based on a sample of clinics representing the three main geographic areas of the country, shed light on an under-studied practitioner population existing in a developing region (and serving a significant segment of the country's host population as well as incoming refugees from surrounding areas). Thus, the findings can provide the impetus to avail and inform interventions to improve practitioner perceptions, knowledge, and practices in this area of the world.

With regards to the current status of healthy lifestyle counseling, there was an under-provision of various important aspects of healthy lifestyle counseling. Only advising cigarette smokers to quit was estimated to have been provided to roughly half of patients seen. When we combined counseling activities, as exemplified by the proportion of practitioners who reported asking about smoking status, exercise status, and diet; and providing evidence-based tips to improve these in the majority of patients, it was evident that there was a dramatic under-provision of comprehensive lifestyle counseling. Relatedly, individual traits existed which could negatively influence the likelihood that PHCPs would engage in healthy lifestyle counseling. Our sample of PHCPs generally did not engage in regular physical activity, did not (in high proportions) follow a healthy diet, and a substantial proportion of physicians (44.2%) were cigarette smokers.

With regards to perceptions, many practitioners believed that patients already knew enough about lifestyle factors such as smoking and did not need further counseling. Furthermore, patient-stemming barriers (as a result of patient attitudes, illiteracy) were the most frequently cited impediments to the provision of counseling. Many of the practitioners in our sample also did not perceive that their counseling would increase the likelihood that a patient changes their behavior. Finally, while knowledge about individual lifestyle factors and their association with cancer was generally high, knowledge levels were substantially lower when examining indicators of comprehensive (in the context of the lifestyle factors and cancers we probed) knowledge.

The determinants of healthy lifestyle counseling by practitioners vary in the literature and include, at the level of the practitioner, age, gender, specialty, extent of training, identifying a lifestyle related risk factor in a patient, practicing the health habit counseled on, reporting confidence to counsel, and perceiving value in the practice.[23,29-32] Our multivariable analyses only revealed self-efficacy as a consistent significant predictor of provision of healthy lifestyle counseling. Self-efficacy, however, is multifaceted, playing an intricate role in determining health behavior both by directly influencing that behavior, and by influencing (and being influenced by) various attitudes and individual characteristics that also influence the performance of the behavior.[22] Our results provide some insight into factors that likely influence self-efficacy, and thus provide various discussion and educational points for inclusion in interventions (such as training) that can improve the self-efficacy of PHCPs to provide healthy lifestyle counseling. Differences amongst physicians and nonphysicians that we detected in some results also emphasize the need to address – in any potential intervention – each professional category in a customized manner.

The possible factors influencing the provision of healthy lifestyle-related services are numerous, and span multiple levels and individuals.[12,33,34] Although we could not cover the full scope of these factors, our findings can contribute data and insight to inform the planning of interventions to improve healthy lifestyle counseling through PHCPs in Jordan.

Our study has its limitations. Our survey was a descriptive cross-sectional one and relied on the use of a tool that had not been previously validated (we designed the tool for the specific purpose of the study). Although our results indicate that the tool was reliable, our findings should be

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interpreted with this in mind. In addition, we were not able to verify practitioner-reported results with objective measures. Documentation systems in the in the clinics we targeted are under-developed, and we also were unable to conduct patient interviews to verify our findings. Nevertheless, given that our results indicate substantial practice and knowledge gaps – particularly when gauging whether or not providers availed several actions collectively, or could identify all the relevant risk factors for the cancers evaluated – it is unlikely that our findings or conclusions would have differed in direction had we supplemented our data with more objective measures. Furthermore, although we highlight the strong association of reported confidence with providing counseling on cancer prevention through healthy lifestyles, our intension was not to identify causal factors but rather offer practical information that can be used in future efforts to educate healthcare professionals in this sector. Confidence is likely to have been shaped by other interrelated factors such as skills, knowledge and perceptions with regards to the value of counseling. Determining these intricate connections was beyond the scope of our study. We also did not include primary healthcare clinics in the Royal Medical Services sector (a subsidized public healthcare system that was built to serve army officers and their beneficiaries and subsequently grew to provide care to non-veterans who are willing to pay for such services). However, the Ministry of Health's primary healthcare clinics in Jordan are the largest primary care services in the country, are accessible to all Jordanians, and are accessed by more than half of the population.[35,36] Finally, with regards to limitations, we were constrained with a purposive sample of 20 clinics. The Jordanian Ministry of Health nominated a purposive sample that it deemed representative of its clinics across the country. Due to time constraints that practitioners in this sector typically face, the Ministry of Health restricted its selection to these 20 clinics. Having said that, we conducted post-hoc power analyses to ensure that our study was sufficiently powered to detect various estimates.

Despite our limitations, we were able to study a sample of clinics that covered the main governorates in the country, and benefited from a relatively high response rate. Our findings indicate that, among Jordanian PHCPs in governmental healthcare clinics, primary cancer prevention services through healthy lifestyle counseling are under-provided. Our data also suggest that there is ample room for improving PHCPs' skills and practices.

Contributorship statement:
1. Nour Obeidat contributed to the planning, conduct, data processing and analysis, manuscript development, and final manuscript review.
2. Malek Habashneh contributed to the planning, conduct, manuscript development, and final manuscript review.
3. Rawan Shihab contributed to the conduct, data processing, manuscript development, and final manuscript review.
4. Feras Hawari contributed to the planning, manuscript development, and final manuscript review.

Competing interests:
The authors have no competing interests to declare.

Data Sharing Statement:

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Extra data is available by emailing nobeidat@khcc.jo

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Table 1. Demographic, professional and lifestyle characteristics of sample of primary care physicians and nurses across Jordan

	Nurses/assistants, midwives (n=218)	Physicians (n=104)
Mean age (range)	35.4 (22 – 55)	42.7 (25 – 64)
Mean years since graduating with highest professional degree (range)	13.5 (1 – 35)	16.3 (1 – 34)
Female n (%)	180 (85.3%)	28 (27.7%)
Currently smoke cigarette n (%)	35 (16.2%)	46 (44.2%)
Currently smoke waterpipe n (%)	29 (13.6%)	19 (18.3%)
Mean BMI (range)	26.8 (16.5 – 77.8)	25.8 (19.1 – 32.8)
Exercise regularly n (%)	26 (12.1%)	21 (20.8%)
Ate legumes on 6 or more days of week n (%)	33 (15.5%)	28 (27.7%)
Ate fruits on 6 or more days of week n (%)	45 (21.1%)	40 (39.2%)
Ate red meat on 3 or more days of week n (%)	76 (36.0%)	54 (52.9%)
Ate fast food on 3 or more days of week n (%)	43 (20.1%)	17 (16.5%)

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3   See attached image.
4
5   **Figure 1. Average proportions of primary care providers' in clinics in Jordan (physicians versus nonphysicians) who reported**
6   **performing various lifestyle-related counseling activities in atleast 70% of adult patients (over 18) they saw;** *Significant chi square*
7   *statistic (p-value<0.05) when comparing physicians to nonphysicians*
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Table 2. Attitudes regarding healthy lifestyle counseling and cancer prevention among practitioners in primary healthcare clinics in Jordan

Statement	Non-physicians	Physicians
Proportion disagreeing/neutral that "preventing cancer is possible" (n=320)*	72 (33.3%)	23 (22.6%)
Proportion agreeing/neutral that "most patients aware of smoking-cancer relation, do not need more information" (n=314)	129 (60.9%)	65 (65.0%)
Proportion agreeing/neutral that "most patients aware of diet-cancer relation, do not need more information" (n=318)	92 (43.2%)	37 (35.9%)
Proportion agreeing/neutral that "most patients aware of exercise-cancer relation, do not need more information" (n=316)	84 (39.8%)	36 (35.0%)
Proportion disagreeing/neutral that "smoking is a medical condition needing treatment" (n=316)	36 (16.8%)	18 (18.0%)
Proportion disagreeing/neutral that "obesity is a medical condition needing treatment" (n=317)	19 (9.0%)	6 (5.8%)
Proportion disagreeing/neutral that they are "bothered when seeing effects of unhealthy lifestyles on patients" (n=310)	35 (16.8%)	14 (14.0%)
Proportion disagreeing/neutral that "likelihood that patient quits smoking increases if I advise him/her to do so" (n=314)	90 (42.7%)	53 (52.5%)
Proportion disagreeing/neutral that "likelihood that patient follows healthy diet increases if I advise him/her to do so" (n=311)	66 (31.4%)	28 (28.3%)
Proportion disagreeing/neutral that "likelihood that patient exercises increases if I advise him/her to do so" (n=313)	77 (37.0%)	39 (37.9%)
Proportion agreeing/neutral that "counseling on prevention of non-communicable diseases (like diabetes and hypertensions) is more important than counseling on prevention of cancer" (n=318)	131 (60.7%)	65 (65.0%)
Proportion disagreeing/neutral that "physicians in clinic should be trained to provide counseling on healthy lifestyle practices" (n=317)	22 (10.3%)	16 (15.7%)
Proportion disagreeing/neutral that "nonphysicians staff in the clinic should be trained to provide counseling on healthy lifestyle practices" (n=321)	24 (11.1%)	9 (8.7%)
Proportion agreeing/neutral that "most patients won't take advice with regards to healthy lifestyle practices seriously" (n=311)	151 (72.3%)	66 (66.0%)
Proportion disagreeing/neutral they "feel more confident counseling patients on healthy lifestyle practices they successfully engage in themselves" (n=321)	29 (13.5%)	8 (7.7%)
Proportion agreeing/neutral they "prefer counseling only patients who they feel will listen to them on healthy lifestyle practices" (n=320)	130 (60.5%)	59 (57.3%)
Proportion disagreeing/neutral that "counseling patients on healthy lifestyle practices gives a feeling of self-respect and self-satisfaction" (n=322)	33 (15.2%)	11 (10.7%)
Proportion agreeing/neutral that "talking about healthy lifestyle practices bothers patients and negatively impacts relationship with them" (n=311)	84 (40.2%)	42 (42.0%)
Proportion agreeing/neutral that "they feel uncomfortable talking about healthy lifestyle practices with patients" (n=318)	81 (37.9%)	35 (34.3%)
Proportion disagreeing/neutral that "patients will change their lifestyle practices for the better if counseled on healthy lifestyle practices" (n=316)	48 (22.8%)	29 (28.2%)
Proportion disagreeing/neutral that their "counseling on healthy lifestyle practices will lower patients' risk of cancer" (n=322)	72 (33.3%)	30 (28.9%)
Proportion disagreeing/neutral that their "counseling on healthy lifestyles will improve patient care" (n=319)*	34 (15.7%)	7 (6.9%)
Proportion disagreeing/neutral that "counseling on healthy lifestyles should be physician's role" (n=322)*	95 (44.2%)	62 (59.6%)
Proportion disagreeing/neutral that "counseling on healthy lifestyles should be nurse's role" (n=321)*	84 (38.9%)	26 (25.0%)

Significant chi square statistic when comparing physicians to nonphysicians (p-value<0.05)

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Table 3. Proportions of practitioners reporting confidence in providing various healthy lifestyle counseling activities within primary healthcare clinics in Jordan

	N (%) nonphysicains	N (%) physicians
Ask about amount and frequency of cigarette or waterpipe use*	119 (55.1%)	70 (70.0%)
Document amount and frequency of cigarette or waterpipe use	98 (46.0%)	54 (54.6%)
Explain effect of smoking on risk of incidence of different cancers*	131 (61.8%)	79 (79.0%)
Advise cigarette smoker to quit*	139 (65.9%)	78 (77.2%)
Advise waterpipe smoker to quit*	134 (63.5%)	75 (78.1%)
Ask patient about his/her dietary habits	139 (65.6%)	66 (68.0%)
Ask patient about his/her physical activity	130 (63.7%)	68 (69.4%)
Explain effect of diet on risk of incidence of different cancers	107 (49.8%)	61 (60.4%)
Explain effect of physical activity on risk of incidence of different cancers*	117 (54.4%)	69 (68.3%)
Explain effect of obesity on risk of incidence of different cancers *	103 (48.1%)	61 (60.4%)
Give patient evidence-based recommendations to improve his/her dietary habits *	125 (59.0%)	75 (74.3%)
Give patient evidence-based recommendations to improve his/her activity*	120 (56.1%)	75 (72.8%)
Give patient evidence-based recommendations on quitting smoking	143 (66.5%)	72 (72.0%)
Reporting confidence in all the above-listed activities*	24 (11.0%)	21 (20.2%)

Significant chi square statistic when comparing physicians to nonphysicians (p-value<0.05)
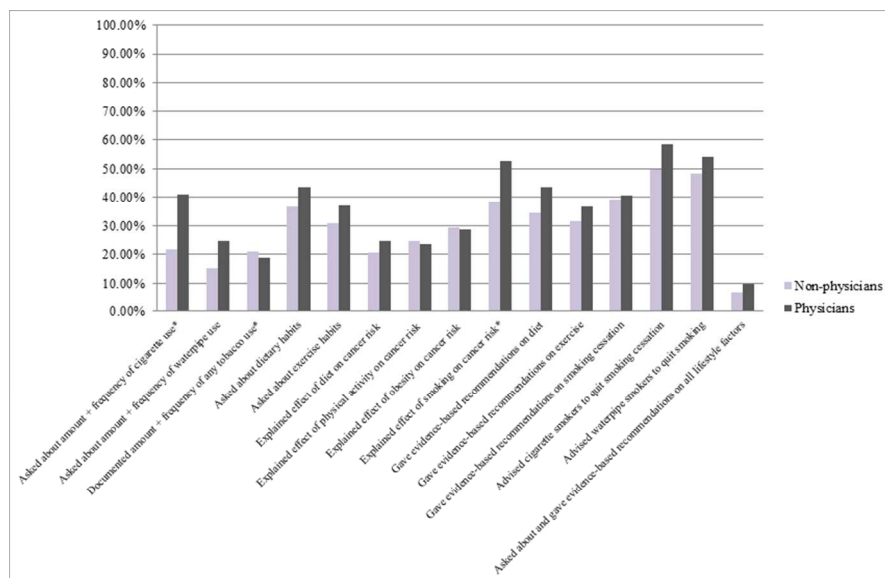
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Figure 1. Average proportions of primary care providers' in clinics in Jordan (physicians versus nonphysicians) who reported performing various lifestyle-related counseling activities in atleast 70% of adult patients (over 18) they saw; *Significant chi square statistic (p-value<0.05) when comparing physicians to nonphysicians

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page in manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	4
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5-6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	5-6
		(*b*) Describe any methods used to examine subgroups and interactions	

(*c*) Explain how missing data were addressed

(*d*) *Cohort study*—If applicable, explain how loss to follow-up
was addressed

Case-control study—If applicable, explain how matching of
cases and controls was addressed

Cross-sectional study—If applicable, describe analytical
methods taking account of sampling strategy

(*e*) Describe any sensitivity analyses

Results

	Item No	Recommendation	Page in manuscript
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	6-7
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	6
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	6-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-7
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	

Discussion

Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	7
Interpretation	20	Give a cautious overall interpretation of results considering	7

		objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	7

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.