Medical Science

25(115), September, 2021

Knowledge, attitude, and behavior of family medicine residents regarding low-dose computed-tomography lung cancer screening at primary care setting in Riyadh, Saudi Arabia in 2020

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To Cite:
Alrabiah BK, Alshammari SA, Alwatban OJA. Knowledge, attitude, and behavior of family medicine residents regarding low-dose computed-tomography lung cancer screening at primary care setting in Riyadh, Saudi Arabia in 2020. Medical Science, 2021, 25(115), 2311-2321

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Peer-Review History
Received: 06 August 2021
Reviewed & Revised: 08/August/2021 to 03/September/2021
Accepted: 05 September 2021
Published: September 2021

Peer-review Method
External peer-review was done through double-blind method.

ABSTRACT

Objective: The present study aimed to assess the knowledge, attitudes, behaviors and encountered obstacles of Low-Dose Computed Tomography (LDCT) lung screening among family medicine residents in Riyadh city, Saudi Arabia. *Method:* A cross-sectional survey was performed over a sample of 202 family medicine residents in Riyadh city. A structured questionnaire consisted of 29 items was used to achieve the study objective. The Statistical Package of Social Sciences (SPSS) was used to analyze the participants' responses. Descriptive statistics were used to analyze the participants' responses to the questionnaire items. *Results:* The findings of the study showed that the recruited family physicians had adequate level of knowledge, neutral attitudes (2.55±0.90) regarding LDCT lung screening. In addition, it was found that discussing the benefits and risks of LDCT lung screening and ordering LDCT for lung screening were the most practiced aspects related to LDCT lung screening by family physicians. Finally, it was found that Concerns of the patients about radiation exposure (1.56±0.78), Difficulty scheduling patients (1.58±0.81) and Limited/lack of CT machines (1.64±0.77) were the most perceived barriers of LDCT lung screening as reported by the recruited family physicians. *Conclusion*: The study concluded that family medicine residents in Riyadh city had an adequate level of knowledge and neutral attitudes towards LDCT lung screening. In addition, the study concluded that patients' concerns of radiation risks and lack of appropriate LDCT scheduling and lack of CT devices were the most barriers limiting the LDCT lung screening in Riyadh city.

Keywords: Low dose Computed Tomography, Lung screening, Knowledge, Attitudes, Family Medicine

1. INTRODUCTION

Lung cancer is a global public health threat and is the leading cause of death due to cancer worldwide (Islami et al., 2015). According to the data of the International Agency for Research on Cancer, lung cancer represents 11.4% of all new cases of cancer detected in 2018 in both gender and 18.6% of all cancer deaths in 2018 in both gender (McGuire, 2016). In Saudi Arabia, statistics indicated about 3.5 folds increase in the lung cancer incidence over the last 3-4 decades (Althibiti & Nour Eldein, 2018). However, the prevalence is lower than seen in the Western countries (Saudi Cancer Registry, 2018; Bray et al., 2020). According to the 2015 data of Saudi Cancer Registry, lung cancer ranked the fifth cancer among male individuals in Saudi Arabia and fifteenth cancer among Saudi females (Saudi Cancer Registry, 2018). Approximately 80% of lung cancer cases detected in Saudi Arabia are among males (Saudi Cancer Registry, 2018). Estimates show that lung cancer cost is expected to markedly increase in the next decade or so due to the cost of care and lost productivity of increasing new cases (Da'ar et al., 2019; Gouvinhas et al., 2018). Despite the progress in the diagnosis and therapy of lung cancer, the overall survival at 5 years did not show significant improvement over the last two decades, remaining below 15% in Western countries and even much lower in developing countries (Cheng et al., 2016; Dubey et al., 2016). Several methods have been proposed for improving the efficacy of screening and early detection of the disease with the aim to improve survival rates; such as chest radiography (X-ray), cytological analysis of sputum, LDCT, and molecular biomarkers (Gouvinhas et al., 2018). LDCT scan has been shown to reduce lung cancer mortality by approximately 17% (Huang et al., 2019). The impact of LDCT lung cancer mortality had been reported to be superior compared to the regular X-ray (Yang et al., 2019).

According to the U.S. Preventive Services Task Force (USPSTF), LDCT screening should be done annually for asymptomatic adults ranging in age between 55 and 80 years who have a history of 30 pack-years of smoking and current smokers or quitted smoking less than fifteen years ago (Reese et al., 2021). Similarly, the American Cancer Society (ACS) recommends LDCT screening among people who are 55-74 years old, are in fairly good health, and who have a 30 pack-years smoking history and currently smoke or have quit smoking less than 15 years ago (Siegel et al., 2021). Saudi lung cancer screening guidelines is almost identical with those ofACS (Jazieh et al., 2018). Additionally they do not recommend screening when the patient had chest CT scan the last year and with specific chest comorbidities (Jazieh et al., 2018).

Although LDCT screening is recommended by the USPSTF and ACSA, utilization is still low at primary care setting (Lewis et al., 2015; Abbasi et al., 2017; Klabunde et al., 2012). For example, a national survey done in the USA among practicing primary care physicians showed that only 22% of primary care physicians have ordered LDCT for lung cancer screening (Klabunde et al., 2012). LDCT utilization was even less among primary care physicians in an academic medical center in the USA (International Agency for Research on Cancer, 2020). According to the Saudi lung cancer screening guidelines, physicians might be playing a significant role in detecting lung cancer at an earlier stage (Jazieh et al., 2018). It has been shown that lack of awareness of lung cancer screening guidelines among both patients and physicians are the major barriers in the utilization (Abbasi et al., 2016). Moreover, it has been suggested that improved awareness of primary care physicians with lung cancer screening recommendations can increase the utilization of LDCT screening (Raz et al., 2018).

Internationally, a number of studies examined the awareness/perception of primary care physicians about lung screening and showed generally low or suboptimal awareness level (Lewis et al., 2015; Abbasi et al., 2017, Raz et al., 2018; Eberth et al., 2018). For example, only 47% of primary care physicians knew three or more of six guidelines related to screening procedure of lung and only 12% have ordered it before for their patients (Lewis et al., 2015). In another study in The USA, 75% of primary care physicians in USA believe the benefits of LDCT screening outweigh the risks and 50% believe it can reduce mortality (Eberth et al., 2018). Additionally, 55% of general practitioners in Pakistan believe that lung screening implementation is highlyefficient in their practicing and only 33% actually using of LDCT screening in their patients (Abbasi et al., 2017).

Primary care physicians were reported to be concerned regarding to how extent LDCT screening is feasible, how much does it cost, and suitability of conducting it (Lewis et al., 2015; Abbasi et al., 2017; Triplette et al., 2018). For example, a sample of primary care American physicians reported the following barriers for lung cancer screening; inadequate time, inadequate staffing, and patients who have different disorders to perform the screening process (Triplette et al., 2018). In another study in The USA, common barriers perceived by primary care physicians included patient cost, harm from false positives, patients' lack of awareness, risk of unintentionaloutcomes, and insurance coverings (Lewis et al., 2015).

The ongoing study was intended for filling the gap represented by the lack of studies discussing this topic. Therefore, the overwhelming concern and objective of the ongoing research was exploring the knowledge, attitudes, practices and perceived barriers of LDCT lung-cancer screening among family medicine residents in Riyadh city, Saudi Arabia.

2. METHOD

Research design

The present study adopted the quantitative research approach through conducting a cross-sectional survey over the family residents in Riyadh city, Saudi Arabia during the period between May 2020 and May 2021. A cross-sectional study can be also called a prevalence study because it is measuring the prevalence at specific time point in a population. In addition, cross-sectional studies describe demographics of the population, for example, age, gender, and education. The benefits of cross-sectional studies include that they are fast and simply performed, as the researcher can study multiple exposures at the same time, and they help to estimate the burden of a variable in a population. Furthermore, cross-sectional studies can be conducted at a single point of time or at a several points; called the serial cross-sectional study.

Research Population

The population in this research was represented by family medicine residents in Riyadh city, Saudi Arabia. According to the latest statistics released by the Ministry of Health in Saudi Arabia, the number of family medicine residents in Riyadh city was 651 family medicine residents distributed over the public and private healthcare settings in Riyadh city.

Sampling and Sample Size

Convenient sampling technique was adoptedin recruiting the study participants in the present study. Using a margin of error of 5%, a confidence interval of 95%, and a response rate distribution of 25%, the minimum sample size of 197 participants was needed for the present study. However, a total of 202 family medicine residents participated in this study. The inclusion criteria set for the participation were being a family resident in Riyadh city, working for at least 3 months in primary care settings, and Saudi nationality. Those participants who were working outside Riyadh or failed to provide an informed consent have been excluded from this study.

Data Collection Measures

To collect data in the present study, the researcher adopted the questionnaire as a data collection tool. The study questionnaire consisted of five parts. The first part was designed for the physician's demographic characteristics (age, gender, marital status, residency level, family history of lung cancer, and smoking status). The second part consisted of 8 items exploring the family residents' knowledge of LDCT lung screening, whereas the third part consisted of five items that assessed the participants' attitudes towards LDCT lung screening and the fourth part consisted of five items that explored the physicians' practices of LDCT lung screening. Finally, the fifth part consisted of eleven items representing the barriers of LDCT lung screening. The questionnaire was designed based on the previous studies (Ersek et al., 2016; Jemal & Fedewa, 2017; Tseng et al., 2019), the guidelines reported in Li et al., (2018) and Saul et al., (2020).

The facial validity of the study questionnaire was ensured through submitting the questionnaire to (7-10) experts (family medicine consultants and oncologists). The content validity of the study questionnaire was ensured through nine review panel experts. Using the Content Validity Index (CVI) to measure the content validity revealed a CVI value of 0.81, which is an acceptable value for the present study. Finally, the reliability of the study questionnaire was ensured through conducting a pilot study over a sample of 25 participants who were excluded from the original study sample. Then, the Cronbach's Alpha coefficient was calculated for the domains and the total questionnaire, they were as following: 0.83 for the knowledge domain, 0.76 for the attitudes domain, 0.86 for the practices domain and 0.79 for the barriers domain. Finally, the value of Cronbach's Alpha for the total scale was 0.81, which is an acceptable value of reliability coefficient.

Data Collection Procedure

The final version of the valid and reliable questionnaire was distributed electronically through Google forms hyperlink. The researcher sent the final version of the questionnaire to the possible participants through social media platforms (WhatsApp, Telegram, etc.). The consent form was used as a starting page that requires the participants' approval in order to move to the next parts of the study questionnaires. The ethical considerations of the present study included obtaining the Institutional Review Board (IRB) approval from King Saud University (Ref. No. 21/0022/IRB). In addition, the researchers ensured the privacy and confidentiality of the participants' identities and their responses.

Data Analysis

To analyze the participants' responses, the researchers used the Statistical Package of Social Sciences (SPSS) (v. 26.0, IBM Corp.). Descriptive statistics (Frequencies, percentages, means and standard deviations) were used to analyze the participants' responses on the domains of the study questionnaire. A mean interval of 1.33 was used to categorize the participants' responses on the attitudes scale (1.00-2.33 for positive attitudes, 2.34-3.67 for neutral attitudes, and 3.68 to 5.00 for negative attitudes).

3. RESULTS

Participant's Socio-demographic Characteristics

A total of 202 family medicine residents were recruited in the present study. The results shown in table (1) represent the participants' socio-demographic characteristics. The mean age of the participants was (28.0± 2.2). Females constituted 51% (n=103) of the study participants, whereas males were about 49% (n=99). The recruited physicians were either single (56.9%, n=115) or married (43.1%, n=87). The majority of the recruited physicians had never smoked cigarettes (79.7%, n=161), whereas previous and current smokers constituted 4.5% (n=9) and 15.8% (n=32), respectively. A high proportion of the recruited physicians had no family history of lung cancer (93.6%, n=189), whereas only 6.4% (n=13) reported a family history of lung cancer. Finally, distributing the recruited physicians based on their residency level revealed that residents in the third level were the highest represented category, as they constituted 42.6% (n=86), followed by second level residents (33.2%, n=67), first level residents (12.4%, n=25), and fourth level residents (11.9%, n=24).

Table 1 socio demographic characteristics of the recruited primary care physicians (n=202)

Variable	M±SD	F(%)
Age	28.0± 2.2	
Gender		
Male		99 (49)
Female		103 (51)
Marital Status		
Single		115 (56.9)
Married		87 (43.1)
Divorced/Separated		0 (0)
Widowed		0 (0)
Smoking Cigarettes		
Never		161 (79.7)
Previous		9 (4.5)
Current		32 (15.8)
Family History of lung cancer		
Yes		13 (6.4)
No		189 (93.6)
Year of Residency		
R1		25 (12.4)
R2		67 (33.2)
R3		86 (42.6)
R4		24 (11.9)

Participant's Knowledge regarding LDCT lung cancer screening

The results shown in table (2) represent the participants' knowledge regarding LDCT lung cancer. The results revealed that 86.6% (n=175) of the recruited physicians agreed that lung cancer reduces cancer mortality. In addition, the results revealed that 38.8% (n=139) agreed that lung cancer screening is cost-effective. Moreover, the results revealed that 92.1% (n=186) agreed that LDCT is better than X-ray in lung cancer screening. Exploring the recruited physicians' knowledge regarding the frequency of LDCT lung cancer screening revealed that 43.6% (n=88) reported that it should be performed annually. However, 43.1% (n=87) indicated that it should be performed every 5 years and 13.4% (n=27) reported that the frequency should be every 2 years.

Investigating the recruited physicians' knowledge regarding the age of the patient eligible for LDCT lung cancer screening revealed that the majority of the physicians believe that between 50 and 80 years is the appropriate age of the patient eligible for LDCT lung cancer screening. However, 12.9% (n=26) reported that the patient should be between 40 and 70 years and only 1% (n=2) reported that between 20 and 60 years is the appropriate age for patients eligible for LDCT lung cancer screening. About 90.6% (n=183) of the recruited physicians reported that both current smokers and former smokers within last 15 years are eligible for LDCT lung cancer screening, whereas 7.4% (n=15) reported that Current smoker or former smoker at any time are eligible for LDCT lung cancer screening and only 2% (n=4) reported that only current smokers are eligible for LDCT lung cancer screening. With regard to the smoking history of the patient eligible for LDCT lung cancer screening in terms of the quantity of the smoked packs, the results showed that 43.6% (n=88) of the recruited physicians reported that the patient should had at least 30 pack-year of smoking, whereas 30.7% (n=62) and 25.7% (n=52) reported that the patient should had at least 20 and 10 pack-year of smoking, respectively.

Finally, exploring the recruited physicians' knowledge regarding the presentations of the patient eligible for LDCT lung cancer screening revealed that 78.2% (n=158) reported that asymptomatic and in fairly good health patients are eligible for LDCT lung cancer screening. However, 15.3% (n=31) reported that the patient should have at least cough and in fairly good health to be eligible for LDCT lung cancer screening, and 6.4% (n=13) indicated that in order for a patient to be eligible for LDCT lung cancer screening, the patient should have at least cough with other chest diseases.

Table 2 Participants' Knowledge regarding LDCT Lung Cancer

Item	F(%)
Lung cancer screening reduces cancer mortality	
Agree	175 (86.6)
Disagree	18 (8.9)
Not Sure	9 (4.5)
Lung cancer screening is cost-effective	
Agree	139 (38.8)
Disagree	25 (12.4)
Not Sure	38 (18.8)
LDCT is better than X-ray in lung cancer screening	
Agree	186 (92.1)
Disagree	3 (1.5)
Not Sure	13 (6.4)
The frequency of LDCT lung cancer screening is	
Annually	88 (43.6)
Every 2 years	27 (13.4)
Every 5 years	87 (43.1)
The age of the patient eligible for LDCT lung cancer screening	
Between 20 and 60 years	2 (1.0)
Between 40 and 70 years	26 (12.9)
Between 50 and 80 years	174 (86.1)
The smoking history of the patient eligible for LDCT lung cancer screening	
Only current smoker	4 (2.0)
Current smoker or former smoker at any time	15 (7.4)
Current smoker or former smoker within last 15 years	183 (90.6)
The smoking history of the patient eligible for LDCT lung cancer screening	
Has at least a ten pack-year of smoking	52 (25.7)
Has at least a twenty pack-year of smoking	62 (30.7)

Item	F(%)
Has at least a thirty pack-year of smoking	88 (43.6)
The presentation of the patient eligible for LDCT lung cancer screening	
Asymptomatic and in fairly good health	158 (78.2)
Has at least cough and in fairly good health	31 (15.3)
Has at least cough with other chest diseases	13 (6.4)

Participant's Attitudes regarding LDCT lung cancer screening

The results shown in table (3) represent the physicians' attitudes towards LDCT lung cancer screening. The results revealed that the participants had neutral attitudes towards LDCT lung cancer screening (2.55±0.90). The physicians had positive attitudes towards being convinced that screening for lung cancer is beneficial for patients (1.95±1.40) and that lung cancer screening can improve the patient management options (2.00±1.27).

Moreover, the physicians showed neutral attitudes towards having sufficient knowledge to demonstrate the advantages and disadvantages of lung cancer screening to their patients (2.67±1.25), that lung cancer screening will place a burden on the healthcare system (3.06±1.34), and that the therapy of lung cancer is more of a suffering than the disease itself (3.11±1.31).

Table 3 Participants' Attitudes regarding LDCT Lung Cancer

Item	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	M±SD
I am persuaded that screening for lung cancer is useful for the patients	121 (59.9)	29 (14.4)	17 (8.4)	12 (5.9)	23 (11.4)	1.95±1.40
I have sufficient knowledge to demonstrate the advantages and disadvantages of lung cancer screening to the patients	47 (23.3)	44 (21.8)	56 (27.7)	39 (19.3)	16 (7.9)	2.67±1.25
I believe lung cancer screening will place a burden on the healthcare system	38 (18.8)	24 (11.9)	66 (32.7)	36 (17.8)	38 (18.8)	3.06±1.34
I believe that treating lung cancer is more of a suffering than the disease itself	30 (14.9)	29 (14.4)	73 (36.1)	28 (13.9)	42 (20.8)	3.11±1.31
I believe that lung cancer screening can improve the patient management options	102 (50.5)	45 (22.3)	21 (10.4)	21 (10.4)	13 (6.4)	2.00±1.27
Total						2.55±0.90

Participant's Practices Related to LDCT lung cancer screening

The results shown in table (4) and figure (1) represent the physicians' practices related to LDCT lung cancer screening. It was found that discussing the benefits and risks of lung cancer screening with eligible patients was the most practiced aspect related to LDCT lung cancer screening (2.65±1.07), followed by ordering LDCT for lung cancer screening (3.13±1.06), discussing the results of lung cancer screening with patients (3.14±1.12), referring patients to a lung cancer screening program (3.26±0.97), and ordering chest X-ray for lung cancer screening (3.62±0.77).

Table 4 Participants' Practices Related to LDCT Lung Cancer

Item	Always	Sometimes	Rarely	Never
I discuss the benefits and risks of lung cancer screening with eligible patients	34 (16.8)	60 (29.7)	50 (24.8)	58 (28.7)
I order LDCT for lung cancer screening	21 (10.4)	38 (18.8)	37 (18.3)	106 (52.3)

Item	Always	Sometimes	Rarely	Never
I order chest X-ray for lung cancer screening	6 (3.0)	18 (8.9)	23 (11.4)	155 (76.7)
I refer patients to a lung cancer screening program	13 (6.4)	36 (17.8)	38 (18.8)	115 (56.9)
I discuss the results of lung cancer screening with patients	29 (14.4)	27 (13.4)	32 (15.8)	114 (56.4)

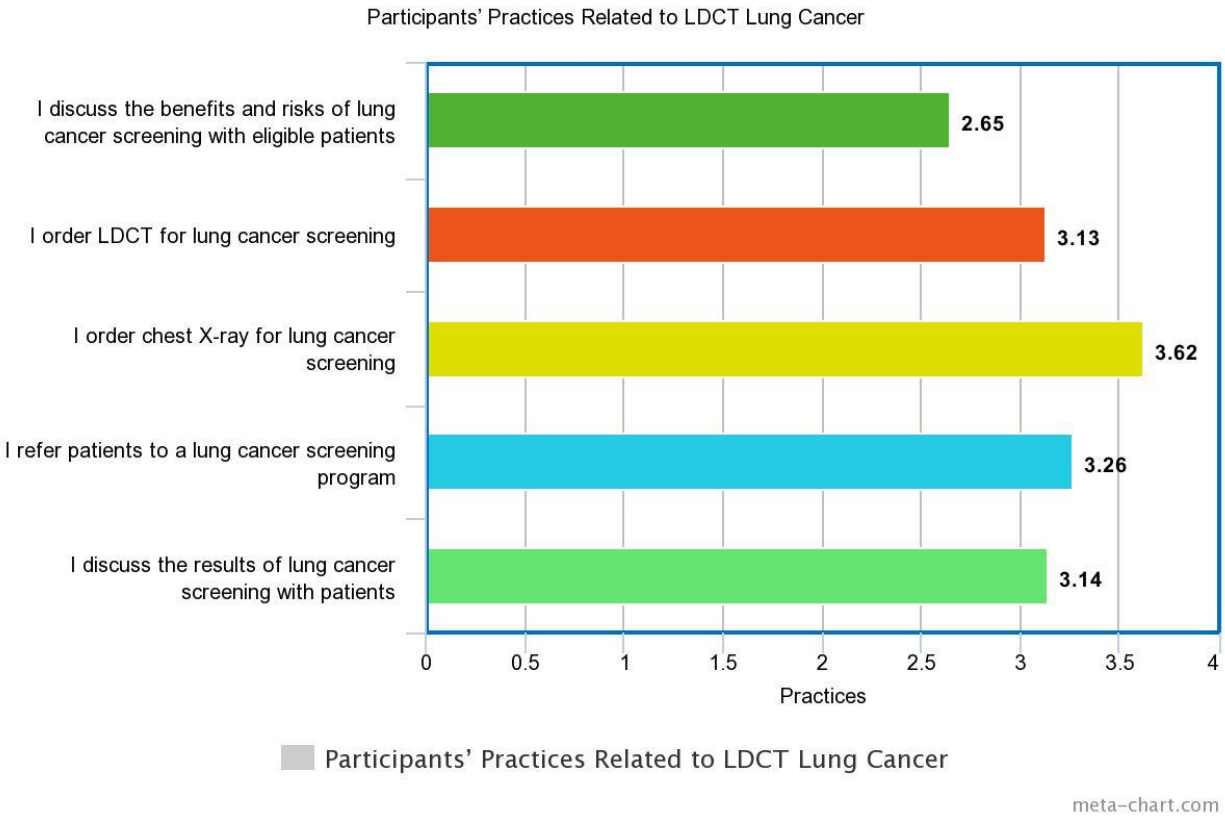

Figure 1 Participants' Practices Related to LDCT Lung Cancer (Mean scores)

Participant's Perceived Barriers for LDCT lung cancer screening

The results shown in table (5) represent the participants' perceived barriers for LDCT lung cancer screening. The results revealed that the most reported barriers for LDCT lung cancer screening were Concerns of the patients about radiation exposure (1.56±0.78), Difficulty scheduling patients (1.58±0.81), and Limited/lack of CT machines (1.64±0.77). On the other hand, the lowest reported barriers of LDCT lung cancer screening were conflictingguidelines about lung cancer (2.11±0.76), insufficient evidence to warrant a screening program (2.21±0.80), and Consequences of false positive results (2.31±0.77).

Table 5 Participants' Perceived Barriers for LDCT Lung Cancer

Item	Agree	Not Sure	Disagree	M±SD	Rank
Insufficient evidence to warrant a screening program	48 (23.8)	64 (31.7)	90 (44.6)	2.21±0.80	10
Conflictingguidelines about lung cancer	48 (23.8)	84 (41.6)	70 (34.7)	2.11±0.76	9
Not enough time to address lung cancer screening	75 (37.1)	93 (46)	34 (16.8)	1.80±0.71	6
Cost of screening	82 (40.6)	59 (29.2)	61 (30.2)	1.90±0.84	8
Limited/lack of CT machines	109 (54)	57 (28.2)	36 (17.8)	1.64±0.77	3
Difficult scheduling patients	126 (62.4)	34 (16.8)	42 (20.8)	1.58±0.81	2

Item	Agree	Not Sure	Disagree	M±SD	Rank
Consequences of false positive results	38 (18.8)	62 (30.7)	102 (50.5)	2.31±0.77	11
Fear of the patients from other incidental findings	100 (49.5)	50 (24.8)	52 (25.7)	1.76±0.84	5
Concerns of the patients about radiation exposure	125 (61.9)	41 (20.3)	36 (17.8)	1.56±0.78	1
Patient refusal	118 (58.4)	24 (11.9)	60 (29.7)	1.71±0.90	4
Leadership at practice not supportive of lung cancer screening	90 (44.6)	50 (24.8)	62 (30.7)	1.86±0.86	7

4. DISCUSSION

The present study aimed at assessing knowledge, attitudes and practices of family medicine residents regarding LDCT lung cancer screening. A total of 202 family medicine residents were recruited in the present study to represent different socio-economic backgrounds. Our findings suggested that the participating family medicine residents had sufficient knowledge regarding LDCT as evidenced by the high agreement that lung cancer screening reduces cancer mortality, the superiority of LDCT over chest X-ray, the cost-effectiveness of the LDCT, the correct agreement over the appropriate age, smoking history and presentations of the patients eligible for LDCT lung screening. These results might be referred to the different educational and awareness campaigns held and introduced by the ministry of health in Saudi Arabia in order to increase both public awareness and healthcare professionals' awareness regarding the necessity of lung cancer screening and its role in reducing the mortality of lung cancer. In addition, these results might be referred to the physicians' awareness of the different international guidelines released by different entities such as the American Association of Thoracic surgery, American Cancer Society and the American Society of Clinical Oncology, which all recommended the annual LDCT for patients older than 50 years with ≥30 pack-year history of smoking and current smoker or quit within past 15 years.

The results of the present study are consistent with the findings reported by Shin et al., (2018) who found that Korean lung cancer specialists had a sufficient and adequate level of knowledge regarding LDCT lung cancer screening. However, the findings of this study are not in line with the findings reported by Ersek et al., (2016) who found that family physicians at South Carolina Academy had insufficient knowledge level regarding LDCT lung screening, as the participants showed lack of knowledge regarding the CT lung cancer screening guidelines released by different American organizations. Moreover, the findings of the study revealed that Saudi family physicians had neutral attitudes towards LDCT lung cancer screening. Going in depth within the attitudes results showed that positive attitudes were related to the beneficial effects of lung cancer screening and its capability of improving the patients' management options, which are both related to the benefits of CT lung cancer screening aspect. However, neutral attitudes were shown regarding having enough knowledge to explain the pros and cons of lung cancer screening to patients, that lung cancer screening will place a burden on the healthcare system, and that the treatment of lung cancer is more of a suffering than the disease itself. These results might be referred to that family physicians lack a significant aspect of knowledge about LDCT lung cancer screening, which is the aspect related to the consequences and the economic impact of LDCT either on healthcare system or the patient, in addition to the benefits and drawbacks of adopting LDCT lung screening over the rest of the screening methods.

The findings of the present study are inconsistent with the findings reported by Tseng et al., (2019) who found that African-American patients who received LDCT had positive attitudes towards LDCT lung screening. In addition, these results are inconsistent with the findings reported by Norman et al., (2020) who found that there were positive public perceptions on lung cancer screening among Australian smokers. However, the context of the ongoing study is different as it examined the attitudes of family physicians, which makes the difference in attitudes reasonable due to the academic and educational backgrounds differences between the samples recruited in these studies. Furthermore, the findings of the study showed that discussing the benefits and risks of lung cancer screening with eligible patients, ordering LDCT for lung cancer screening, and discuss the results of lung cancer screening with patients were the most reported practices of LDCT by family medicine residents. However, the practices of LDCT among family medicine residents were still low, which might be referred to their lack of knowledge regarding LDCT and their neutral attitudes towards LDCT. It is clear from the findings related to the practices that the physicians' role was restricted to having discussions with the patients and ordering LDCT for lung cancer screening, while referring patients to a lung cancer program was very low practices aspect of LDCT by family medicine residents. These results are consistent with the findings reported by Ersek et al., (2016) who found that the most practiced aspect related to LDCT lung screening among family physicians

were discussing the benefits and risks of LDCT, whereas there was a low practice of referring patients to lung cancer screening program.

Our findings revealed that concerns of patients about radiation exposure, difficulties scheduling patients, limited/lack of CT machines and patient refusal were the major barriers for LDCT. These results might be referred to the lack of patients' knowledge about the benefits and risks of LDCT lung cancer screening and the high pressure exerted on the public hospitals in Saudi Arabia, especially the setting of the study, as these settings provide healthcare services for a large proportion of the Saudi population. These results are evidenced by the findings reported by Shaaban & Sheaikh (2018) who found inadequate levels of knowledge and attitudes of Saudi population regarding the benefits and risks of radiation. In addition, these results are consistent with the findings reported by Coughlin et al., (2020) who found that patient refusal is a major barrier of LDCT lung cancer screening among primary healthcare professionals in 3various healthcare facilities in the United States. Moreover, the findings of the ongoing study are consistent with the findings reported by Lei & Lee (2019) who found that lack of knowledge regarding radiation exposure is a major barrier of LDCT lung cancer screening.

The strength of the present study lies in its purpose, which is exploring the knowledge, attitudes, practices and barriers of LDCT lung cancer screening among family medicine residents in Saudi Arabia. This study is considered one of the few studies exploring this topic and provided baseline data about the physicians' knowledge, attitudes, practices, in addition to the barriers encountering them when dealing with patients eligible for LDCT lung cancer screening. The data provided in this study might be used to establish more comprehensive and focused studies to assess the knowledge, attitudes and practices related to LDCT among healthcare providers in different healthcare settings in Saudi Arabia.

The limitations of the present study could be summarized by geographical limitations, as the present study was performed in a healthcare setting in Riyadh city and this could limit the generalization of the study findings to other geographical zones. In addition, the present study is limited to family medicine residents, which makes the findings less applicable to physicians from other departments and levels.

5. CONCLUSION

The present study aimed at exploring the knowledge, attitudes, practices and perceived barriers of LDCT among family medicine residents in Riyadh city, Saudi Arabia. The findings of the study showed that family medicine residents had an adequate level of knowledge regarding LDCT lung cancer screening. However, the participants held neutral attitudes towards LDCT lung cancer screening. Moreover, the findings of the study showed that discussing the benefits and risks and to order LDCT lung cancer screening were the most practiced aspects related to LDCT lung cancer screening. Finally, the study found that patients' concerns about the risks of radiation, lack of CT devices and patient's refusal were the major barriers limiting the LDCT lung cancer screening. Based on the findings of the present study, the study recommends conducting more awareness campaigns that aim at increasing both public and healthcare providers' knowledge and awareness regarding LDCT lung cancer screening, clarifying the benefits and risks of LDCT lung cancer screening. Moreover, it is recommended that the healthcare authorities in Saudi Arabia conduct more educational and training sessions to increase the physicians' knowledge and awareness of LDCT lung cancer screening.

Acknowledgment

The authors would like to extend their gratitude to King Saud University Medical City (KSUMC) for their unlimited support during the data collection process in this study. In addition, the authors would like to thank the participants for spending their valuable time filling in the study questionnaire and contributing to the accomplishment of this manuscript.

Author contribution

The authors would like to declare that all authors of this manuscript had contributed equally in the production of this final version of the original research paper. All authors contributed equally in reviewing literature, designing methodology, data collection and processing, writing the manuscript and reviewing the final version.

Informed consent

A written informed consent was obtained from all physicians recruited and participated in this study. Additional informed consent was obtained from individuals and institutions whom identifying information is included in this manuscript.

Ethical approval

This study was approved by the Institutional Review Board of King Saud University Medical City (Ref. No. 21/0022/IRB).

Conflicts of interest

The authors declare that they have no conflict of interest.

Funding

This study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

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