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Rebecca Harper Date

Surveying barriers to Colorectal Cancer screening in Jordan

By

Rebecca Harper
MPH

Hubert Department of Global Health

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Ghada N. Farhat, PhD, MPH
Committee Chair

____
Yousef Khader, ScD, MSPH, MHPE, MSc
Committee Member

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Rebecca Harper

Bachelor of Science
University of South Florida
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Thesis Committee Chair: Ghada N. Farhat, PhD, MPH

An abstract of
A thesis submitted to the Faculty of the Rollins School of Public Health of Emory University
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Abstract

Surveying barriers to Colorectal Cancer screening in Jordan

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Colorectal cancer (CRC) is the most common cancer for men in Jordan, and the second most common for women (Globocan, 2020). There is a need to better understand the underlying factors that have resulted in very low screening rates, with studies indicating a 12.6% referral rate and a 9.1% uptake rate (Ahmad, 2015). Patients are hesitant to receive CRC screenings because of poor public awareness of the risk factors and screening options(Abuadas et al., 2018; Omran et al., 2015), while also experiencing practical obstacles to meeting routinely with providers (Hammad et al., 2022). Similarly, reduced supportive resources for providers and workloads create barriers to higher CRC screening advocacy to patients(Abuadas & Abuadas, 2019; Ahmad et al., 2015). The intention of this work was to better understand the motivators and barriers to CRC screening as perceived by healthcare providers in Jordan.

We conducted a cross sectional survey of 153 primary healthcare providers in two Jordanian health governates that applied social implementation principals to assess factors that influence their decision to discuss CRC screening with their patients. The Theoretical Domain Framework (TDF) is a social-behavioral implementation framework used to understand the mechanics of specific behaviors with 12 of the 14 main domains representing various personal, social, and psychological factors, which were used in this survey to evaluate the context of practice for Jordanian providers. Attested knowledge varied between different types of Jordanian providers, while confidence in the reliability and availability of all screening options remained high. Responses also strongly indicated that providers were aware of social and personal concerns around CRC screenings but felt unsure of their ability to relieve these concerns. Respondents included 46% male providers and 54% female providers, with the majority of those being physicians (69%). Practice distribution among respondents was 45% urban, 42% rural, and 11% indicating practice in other areas. Concerns with resources capacities, knowledge levels between provider types, and logistical issues for patients strongly indicated that additional public health education and clinical support measures are needed to improve the uptake of CRC screenings in Jordan.

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Chapter 1: Introduction

Problem Statement

Colorectal cancer (CRC), or cancer of the colon and rectal tissues, is the third most common cancer globally and the second leading cause of death (Globocan, 2020). Despite being highly treatable at early stages, wide worldwide variations exist in the use of colorectal screening measures that are essential to detecting the cancer before it is able to spread. The awareness of and access to screening measures is essential to reduce CRC incidence and mortality (Nikbakht et al., 2020; Tran et al., 2021), but in practice these are often uneven or inadequate across populations, as has been seen in the Eastern Mediterranean Region (EMR) (Fadhil et al., 2021; Kulhánová et al., 2017). Inadequate access to reliable information can cause inaccurate and harmful information to spread in a population, reducing the willingness to seek out screening and perpetuating the disconnect between well-trained healthcare providers and the at-risk public ADDIN EN.CITE (Abuadas & Abuadas, 2019; Omran et al., 2015; Rababah et al., 2018). A thorough understanding of the context that influences screening practices at the individual, healthcare provider, and health system levels is fundamental for improving CRC outcomes.

CRC mortality rates have been declining at a global level (Rawla et al., 2019) but increases in regions with rapidly expanding economies necessitate new approaches to change health infrastructures and social perception of preventative care as a priority. Following global and regional trends in CRC incidence indicates that the burden of this disease is unlikely to subside in the near future, and the public understanding of the risk CRC carries is insufficient for the average person to prompt preventative care without intervention by trained medical providers and extensive social, economic, psychological and practical support ADDIN EN.CITE (Kulhánová et al., 2017; S., 2019). In the Eastern Mediterranean Region (EMR), incidence and mortality rates from CRC have increased in recent years (Kulhánová et al., 2017). CRC mortality constitutes the fourth highest cause of cancer-related death in the EMR, with over 27, 000 lives lost in 2020. In terms of incidence, CRC ranks 3rd, with over 50, 000 newly diagnosed in 2020 (Globocan, 2021b). The combination of increasing incidence and mortality in the region presents a pressing issue in managing the burden of CRC, with the influence of risk factors growing and the increase of mortality showing a deficiency in disease management. Jordan follows a similar trend as other EMR countries, despite having medical professionals that are well trained in CRC risks and screening methods (Rababah et al., 2018; Taha et al., 2019) to control disease burden, screening efforts are faced with very low risk perception in the public, with many underestimating the personal risk of developing CRC despite fear of the implications of a diagnosis (Abuadas & Abuadas, 2019; Omran et al., 2015). Education related to disease risk and screening, as well as increasing screening opportunities, will allow for the development of a proactive public, and previous studies have indicated that the EMR, and Jordanian public in particular, would be willing to adjust their preventive medical behavior if advised by a trusted medical provider (Omran, 2015).

The EMR has an opportunity to promote early detection of colorectal cancer by reducing barriers to screening at the individual, health system, and broader societal levels. As Jordan and neighboring economies continue to grow, opportunities to control CRC in their populations will be possible through the devotion of resources to improve screening and disease management.

Purpose Statement and Aims

The Eastern Mediterranean Public Health Network (EMPHNET) and Emory University are investigating options to expand CRC screening and preventative measures in Jordan and, at a later stage, the EMR. Before interventions can begin, however, the social, psychological, economical, and physical barriers that limit the availability, accessibility, and acceptability of CRC screenings must be better understood. The Theoretical Domains Framework (TDF) offers a theory-driven approach to identify such barriers comprehensively. Developed by implementation and behavioral scientists to guide the development of interventions, the TDF characterizes 14 domains of influence on a certain behavior or practice, such as CRC screening (Atkins et al., 2017).

This study was designed as part of a multi-stage project the uses TDF-based assessments to fully understand the perceptions, attitudes, and barriers of Jordanian healthcare providers and the general public around colorectal cancer screening with the intention of developing a nation-wide program to improve screening rates. The current work focuses on healthcare providers in primary healthcare centers and applies the TDF to assess multi-level factors that influence their decision to discuss and recommend CRC screening to their patient population. The study was cross-sectional and used an online survey tool to reach a sample of 153 providers, that included physicians, nurses, specialists, midwives, and others. A broad definition of providers was adopted to include any professional who provided medical care for Jordanian as well as refugee patients in the setting of a primary health center, allowing for a more comprehensive understanding of whether and how patients receive CRC screening information when seeking primary healthcare.

Significance Statement

The work has provided a better characterization of barriers to colorectal cancer screening from the perspective of healthcare providers who frontline discussions and recommendations around CRC screening with patients and at-risk individuals. The study contributes to the literature utilizing the TDF to assess multi-level influencers on practices and behaviors, and further demonstrates the utility of this comprehensive framework (Lipworth et al., 2013; Phillips et al., 2015). Using this framework, our study allowed for a more thorough understanding of the motivators and barriers for providers when considering CRC screenings discussions, giving insight into what the providers' self-limitations are and how they view their role in reducing the harms of CRC in the community. Characterizing the reasons behind the provider's behavior to discuss and recommend CRC screening to their patient will provide better structure to services improvement in Jordan and later expanding to other countries in the EMR. Health system barriers in particular can be assessed through providers better than from the general public, as providers are uniquely aware of limitations in the healthcare system. This perspective can provide better insight to the infrastructure changes needed to increase screening potential on the ground, allowing for direct allocation of resources in novel interventions in the short-term while extensive health system improvements are implemented. Supplemented with a planned survey to assess barriers through the lens of the general public, findings from this work will provide a strong foundation to inform the design of contextually relevant interventions and programs to promote CRC screening rates, with the ultimate goal of improving CRC outcomes in Jordan, and at a later stage, other countries in the EMR.

Chapter 2: Literature Review

Burden of colorectal cancer

Colorectal cancer (CRC), despite being a highly treatable disease in early stages with a global 5-year survival rate of 64% (Cancer.Net, 2022), remains the third most common cancer in the world, accounting for 10% of cancer incidences and 9.4% of cancer deaths (Xi & Xu, 2021).

Similar to many common cancers, CRC is generally asymptomatic until late stages of the disease and necessitates routine screening for those at risk in order to identify and treat the cancer early and improve patient outcomes ADDIN EN.CITE (Vogelaar et al., 2006). The global pattern of incidence, mortality, and disease detection varies significantly across contexts and relates to multi-level factors that play out at the individual, heath system, and national levels.

The burden of CRC shows a correlation with socioeconomic status where countries of high Human Development Index (HDI) – a summary indicator of income, education, and longevity – have higher CRC incidence and mortality (Sharma, 2020). The increase in incidence is thought to be a result of the increasing prevalence of risk behaviors, as the etiology of CRC is driven to a larger extent by modifiable lifestyle behaviors than genetic predisposition (Cheng et al., 2018; Keum & Giovannucci, 2019). Smoking, alcohol use, and poor diet are the most commonly seen risk factors worldwide, and these behaviors have been independently increasing alongside increasing personal incomes within high-HDI countries ADDIN EN.CITE (Beverly Green, 2021; Hammad et al., 2022). In nations that are rapidly transitioning on the HDI spectrum, like China, Brazil, or Jordan, the risk of mortality from CRC is higher because risk factors become more prevalent before medical access and non-emergency cancer care is able to meet the demands (Hammad et al., 2022). For high-HDI nations alone, CRC is the third most common cancer and accounts for 10.3 deaths per 100,000 population (Globocan, 2021).

As the early stages of CRC are asymptomatic and later stages result in a higher mortality risk, screening is essential to detect and treat the disease early and improve survival and outcomes (Rawla et al., 2019). Incidence of CRC is most often seen in adults over 45 years old, and the quality and length of life in those that develop can improve through early identification and management of the disease (Kanth & Inadomi, 2021). Reducing the disease burden of individual CRC is essential to limiting the impacts in the population and relies heavily on the use of annual screenings to identify and remove polyps when they are most treatable (Li & Lai, 2009). Improving screening rates relies on increasing the availability and access to screening services across health systems, advocating for patients to receive screening, and increasing public understanding of the necessity for undergoing screening procedures consistently and in a timely manner (Vogelaar et al., 2006).

The Eastern Mediterranean Region (EMR), one of six world regions defined by the World Health Organization, faces a considerable burden of CRC represented by the cancer being the second most common in incidence the fourth most common cause of death as of 2021 (Pourghazian et al., 2019). Within the EMR, 6.9% of all newly diagnosed cancers are colorectal, and CRC causes 27,061 deaths annually (Globocan, 2021b). Screening options vary widely across the region based on the availability and expertise of providers, health system-level factors such as the availability of treatment options following detection, as well as the perception and acceptability of screening methods among the at-risk population (Kulhánová et al., 2017). Although universal healthcare is available in many of the countries in this region, with varying levels of coverage (Hammad et al., 2022), long-term survival rates of cancer are below those of Europe and North America, with the 5-year rate at 57% ADDIN EN.CITE (Nikbakht et al., 2020). The EMR has undergone significant growth in recent years, and while the growth has been uneven across the region, there are indicators that the increase of economic productivity has altered individual patterns of behavior which may have increased both disease risk and the potential to seek preventive care (Fadhil et al., 2021).

Although the health burdens and health systems differ between nations in the region, there are trends in cancer rates and associated care that appear common, indicating a relative similarity in disease risk and barriers to preventive care experienced by people across the EMR. As incidence has increased alongside access to diagnosis and treatments, there has been growing interest from public health and medical practitioners to pursue organized screening and cancer control programs in the region, but implementation of such efforts is lagging behind ADDIN EN.CITE (Znaor et al., 2021). On a national level, the Kingdom of Jordan has potential to begin improvements through the development of an organized, routine screening program and interventions that recognize and address the unique barriers of the EMR and Jordanians specifically. The development of such a program stands to benefit the Jordanian population, as reports indicate the rates of CRC diagnosis in the country are increasing by 15% annually (Alefan et al., 2017).

Colorectal cancer types and biology

Colorectal cancer is the collective description of typically slow-developing disease starting as a benign adenoma in the mucosal membrane of the lower gastrointestinal tract lining and growing within the inner intestinal tissue wall, where it may spread to nearby lymph nodes, or metastasize into surrounding tissues (Cancer.Net, 2022; Rawla et al., 2019). Although cancers in the colorectal tissues collectively have the same pattern of development, screening, and treatment, cancers originating in the rectum are seen to be slightly more difficult to treat and show a 3% decrease in their 5-year survival rate (Kanth & Inadomi, 2021). Survival decreases rapidly as the cancer spreads outside of the colorectal tissues, with a 20% decrease once it has spread to the proximal lymph nodes and a nearly 75% decrease once the cancer has spread to distal tissues (Kanth & Inadomi, 2021). Development of CRC can take as long as 10 years from first incidence to a terminal stage, with recurrence more likely when growth has metastasized into other tissues (Montminy et al., 2020). While presentation of the disease differs by individual, the most common symptoms are constipation, abdominal pain, blood in the stool, and reduced nutritional absorption (Montminy et al., 2020; Rawla et al., 2019). Although surgical and chemotherapy treatments are very effective in the early stage of development, treatment becomes significantly less effective and more costly once symptoms appear (Montminy et al., 2020; Rawla et al., 2019).

Etiology and primary prevention

Colorectal cancer, involving tissues of the colon and rectum, is understood to be largely a result of modifiable risk factors attributed to lifestyle choices (Rawla et al., 2019). Much like how tobacco use has been shown to increase the risk of lung cancer, the increase in exposure to behaviors like tobacco use, heavy alcohol use, or poor nutritional habits have been seen to be reliable predictors of CRC incidence. Incidence of CRC was found to increase as the prevalence of these behaviors became more common in the general population, linking back to the positive correlation observed between a country's HDI and the frequency of CRC diagnosis (Sharma, 2020). The increased frequency of these risk factors is thought to be linked to increased adoption of 'Western' lifestyle traits, characterized by more sedentary work and poor, convenience-based diets as well as the increased use of luxury items like alcohol and tobacco, especially in those with increased disposable income ADDIN EN.CITE (Al Qadire, 2018; Keum & Giovannucci, 2019). Poor diet and reduced physical activity have been seen to work in tandem to raise the risk of a variety of non-communicable diseases through increased immune and tissue stress (Li & Lai, 2009). Stress responses are also seen in tobacco and alcohol use increasing CRC risk, as the use of these substances damages tissues throughout the body, increasing the opportunity for the development of cancerous growths (Zisman et al., 2006). Control of these risk behaviors, along with control of gastrointestinal disorders like Crohn's disease or Irritable Bowel Syndrome

(IBS), allows for reduction of incidence of CRC by reducing the strain on the colorectal tissues (Kanth & Inadomi, 2021). Familial history of CRC is shown to increase risk of CRC, both because of inheritable disorders that increase risk and because families more often share living circumstances and 'inherit' risk behaviors in social settings (Ssewanyana et al., 2018). Previous personal history of CRC is also shown to increase one's risk of developing CRC again at a later point as well as cancer in other parts of the body, necessitating personal vigilance for possible signs and routine screening.

In a study of individuals at average-risk for CRC, those who followed a "Mediterranean diet" lifestyle, which encompasses nutritional and physical activity habits traditional in some Mediterranean cultures, were less likely to develop CRC in comparison to those who did not fully adhere to this lifestyle or followed more "Western" behavior patterns (Collaborators., 2018) . In the Eastern Mediterranean region specifically, it was seen that adoption of a Mediterranean lifestyle, or large portions thereof, was shown to significantly reduce the likelihood of developing negative health impacts later in life, including colorectal cancers (Nikbakht et al., 2020).

The gradient of CRC risk is such that the combination of CRC-linked factors is more likely to result in an earlier incidence of the cancer, while a relatively isolated risk behavior, like alcohol use, shows a dramatically smaller chance of independently increasing the personal likelihood of CRC incidence (Rawla et al., 2019).

Screening and Early detection

Following risk factor reduction, identification of CRC at early stages is fundamental to improving survival and reducing the overall impact of the disease within a community. As with many cancers, CRC is known to be highly treatable and curable if detected while the cancerous tissue is localized to the bowels, with 50% of disease being curable with surgical procedures and a 5-year survival rate of 97-89% (Globocan, 2020; Xi & Xu, 2021). Reducing or eliminating the cancer is based on how early in development the cancer is detected, as the spread into other parts of the body causes the 5-year survival rate to drop from 97-89% to 17-14% (Li & Lai, 2009; Schreuders et al., 2015).

Colonoscopy is the most common method of screening, using sterile endoscopy to assess the colon for signs of damage and abnormal growths. This technique is regarded as the most accurate because of the ability to visually identify and biopsy tissues that may be of concern. Frequency is dependent on an individual's risk of developing cancer, with average people undergoing the screening once every ten years starting around age 45 (Society, 2018). Patients with prior cancer or a significant genetic disposition for colorectal cancers are advised to receive colonoscopy as frequently as every 5 years (Society, 2018). Sigmoidoscopy is a less invasive scoping procedure that uses the same endoscopic methods but limits the scope to the lower colon as opposed to the full colon in the case of colonoscopy (Society, 2018). Lower risk patients, often those eligible due to age, can receive this screening once every five years to manage their colon health. This longer period between screenings for sigmoidoscopy and colonoscopy encourages compliance by reducing the logistical burden on the patient. While colonoscopy is more comprehensive, sigmoidoscopy can be more practical for patients with a higher risk of bowel perforation or a larger risk of rectal cancers. Both are time consuming for the patient and provider, as access to the clinical space, staff, and supplies is difficult to coordinate and limits the potential number of screenings a provider can conduct weekly (Randel et al., 2021). Patients must also be educated in the preparation and recovery needs

While invasive colonoscopy exams remain the gold-standard of screening, the use of stool-sample testing provides a valuable assessment of gastrointestinal (GI) health with minimal clinical contact (Randel et al., 2021). These tests use a variety of targets to identify signs of CRC, with the most common being occult blood and immune system byproducts present in the stool. This testing allows for the distinction of CRC adenomas from other gastrointestinal disorders in average risk patients and allows for patients and providers to understand the CRC risk and overall GI health with the lowest logistical burden. Fecal Occult Blood Test (FOBT) uses indications of blood in stool to non-invasively detect anomalies within the GI tract and is one of the most commonly recommended for average-risk patients undergoing CRC screening. These tests are useful tools for directing clinical decisions before diagnosis and understanding the colorectal health of average-risk patients but are not recommended to be used for a definitive diagnosis due to the confounding of other systemic diseases that can be found in the GI tract.

These less invasive options like FOBT can be available for a wider population if the laboratory transport and supply chain to support this testing exist (Tepus & Yau, 2020). These tests can be taken in a patients' home and sent to a testing facility, but this process relies on a timely transport and clinical testing infrastructure that allows delivery and testing of samples (Hakama et al., 2008). While differing targets improve the ability of these types of tests to detect anomalies in the colorectal tissues, FOBT is the most commonly recommended for average-risk patients. While useful in ruling out development of CRC and other GI disorders, a positive test result will necessitate a follow-up colonoscopy to better evaluate the cause and possible routes of treatment.

Barriers to Screening CRC

As the burden of colorectal cancer increases across the globalized world and use of genetic risk assessment is seen to be significantly less effective in predicting the incidence of CRC than in other cancers, improving early detection and increasing screening rates are critical. The American Cancer Society reports that alongside the use of other mitigating factors like modified risk behaviors, the use of common screening methods for colorectal cancers was found to theoretically reduce mortality by 35-56% globally if current screening efforts were maintained (Xi & Xu, 2021).

Navigation of the preventative medicine process can prove to be a difficulty for providers and patients, especially when the infrastructure to guide the process is not consistently supportive. Endoscopic screening modalities like colonoscopy and sigmoidoscopy are invasive and time consuming, usually requiring alterations in diet and taking place over multiple days. Additionally, these measures require multiple trained providers to conduct the sterile procedure in a clinical setting. This constitutes a considerable barrier against screening.

Many patients have limited understanding of screening options and their personal level of risk, as social misconceptions of risk factors and diagnostic procedures are more prevalent than reliable medical advice (Tran et al., 2021). On average, roughly 69% of American patients eligible for CRC screenings are up-to-date on their screenings, with top health systems in some states reaching 80% compliance (NCCR, 2022). In countries with nationalized healthcare, as in the United Kingdom, screening rates trend around 54% and progression of CRC is shown to be slightly less than the worldwide average, with a high 5-year survival rate of over 90% ADDIN EN.CITE (Weller et al., 2007). Efforts to utilize organized screening within a nationalized healthcare system could improve the annual screening rates even more, but such a program implemented in Croatia was seen to fail as the lack of education by a trusted medical provider resulted in screening participation rates as low as 20%. This indicates that a hybrid approach, using opportunistic screenings of routine patients alongside public outreach to those that are at higher risk (due to risk behaviors, lack of access to medical care, and age), would be necessary without extensive public education and awareness of the need for CRC screenings for those in the recommended age group (Hakama et al., 2008). Appropriate concern for CRC risks in the average person has been seen to result in a reduced adherence to screening and preventative measures, as many of opportunistic methods rely on patients arranging for the screenings with limited information on their options. Improving on the health education of patients would bolster efficacy, while allowing for misconceptions of CRC risks and the screenings to be addressed and managed by trained professionals.

In the EMR, a lack of social and personal awareness is seen to be the primary barrier to routine CRC screening as the necessity and timeliness of these measure is poorly understood, contributing to delays in cancer identification and poorer outcomes when diagnosed (Kulhánová et al., 2017). Patient education by a trained healthcare provider is seen to be the best way to improve awareness of CRC risk and screening options globally, but relies on patients to have consistent access to routine medical care, something that is applied unevenly across the EMR and hinders regional improvement in CRC outcomes and mortality rates.(Fadhil et al., 2021; Hatamian et al., 2021). As seen in Bahrain (Nasaif & Al Qallaf, 2018), Jordan (Abuadas & Abuadas, 2019), Egypt (Fadhil et al., 2021), and the United Arab Emirates (Al Abdouli et al., 2018; Fadhil et al., 2021) studies of respective populations' awareness of CRC have shown high concern of the disease but a largely underestimation of personal risk, resulting in a low prioritization of screenings even in the recommended age range (Nikbakht et al., 2020). Within

Jordan this underestimation is seen across age groups from university students to older adults, while common misconceptions on the “harms” of colonoscopy are more prevalent (Arqoub et al., 2019; Mhaidat et al., 2018).

This lack of health education was seen to be barrier for CRC screenings in Jordan, with patients with a history of cancer or a chronic gastrointestinal disorder more likely to understand the risks and seek screening than an average risk patient. Improving on self-advocacy and participation relies on increasing public awareness of risks and centering health education on cultural concerns and preferences, which would necessarily vary across regions (Znaor et al., 2021). While these surveys further support the need for health education, the need to broach social and cultural concerns surrounding invasive screenings at multiple cultural fronts is shown to be fundamental to meeting patients where they are with the information needed to improve their health (Omran et al., 2015).

The workload of health providers causes for shorter available times than is ideal for routine screenings and health education meetings, creating a shortage of available medical resources specifically focused on long term preventative care (Fadhil et al., 2021; VAND et al., 2022). The inability to regularly see a healthcare provider is also a barrier to receiving routine CRC screening, as the financial and time expenses are infeasible for more of the general Eastern Mediterranean public than is ideal to maintain high screening rates. (Pourghazian et al., 2019). General accessibility to healthcare is a pivotal issue in increasing screening, as providers are influential in the education and awareness of their patients as to their risk levels. Within Jordan, the availability of screening resources is uneven between urban and rural areas, but residents across northern Jordan expressed a willingness to receive a colonoscopy screening at personal cost if advised by a physician (Omran et al., 2015).

The presence and advisement of the physician was seen instrumental in increasing acceptance of CRC screening, and surveys of healthcare trainees indicate a shift in priorities to address longer term preventative and health management routines to identify health issues before they become critical (Mhaidat et al., 2018). In a 2018 survey of Jordanian medical trainees, there were very low levels of knowledge of CRC risks and barriers to screening in later term students, indicating a systemic need to improve awareness not just in patients, but in the practitioner population as well (Mhaidat et al., 2018).

Increasing the number of providers who are knowledgeable and able to educate patients on CRC risks and screening requires a sufficient number of well-trained providers to be in practice across the region, but countries across the EMR have seen issues in maintaining proper patient-to-provider ratios (Nashat et al., 2020). The workload for these practitioners precludes routine screening as immediate and short-term treatments are prioritized, especially as national recommendations are usually very limited and largely not known by practitioners (Taha et al., 2019). Increasing availability of in-home health workers can make up the staffing disparity and improve access to well-trained care workers who would be uniquely qualified to provide in-depth health education to those most at risk of developing CRC either due to age or concurrent illnesses (Ajlouni et al., 2015; Al-Husban et al., 2021)

While the increase in trained, accessible medical personnel in the EMR would benefit the population by delivering reliable information and effective recommendations, national and regional improvements to the larger healthcare systems would be necessary as well. While universal healthcare remains an unrealized goal for the region (Maha El-Rabbat, 2020), the development and implementation of standardized policies across Jordan and the EMR allows patients and providers to better understand what to expect from the CRC screening process, creating a consistent experience that is more accessible and predictable to the general public. In Jordan in particular, improving on supportive care networks and access to specialized healthcare professionals can support greater patient education and trust in the healthcare infrastructure, providing greater adherence to preventative care including CRC screening (Ajlouni et al., 2015; Al-Husban et al., 2021).

Despite the different circumstances across the EMR, common barriers to CRC screening can be seen across the region. Awareness of personal health risks, health education, and availability of healthcare professionals are the most common and indicate deficiencies in the preventative health infrastructure. Perception and knowledge of colorectal health risks is key to managing the wellbeing of most patients, and improvement at every level requires increasing access to health education materials. Increasing screening rates relies on improving the ability of patients to improve their awareness and agency within the existing systems as well as improving on the public health infrastructure to better address future needs.

Chapter 3: Manuscript

Abstract

Background

Colorectal cancer (CRC) is the fourth most common cancer globally and represents the fourth most common cause of cancer-related death in the WHO Eastern Mediterranean region (EMR) despite the decreasing trends in mortality globally (Globocan, 2021). While incidence and mortality have been decreased in areas using a preventative health education and screening of patients when they become most at-risk, studies indicate that implementation of such is not consistent across the EMR (Fadhil et al., 2021).

In Jordan particularly there is a need to better understand the underlying factors that have resulted in very low screening rates, with a survey of the public indicating a 12.6% referral rate and a 9.1% uptake rate (Ahmad, 2015). While patients may be hesitant to seek out CRC screenings because of poor public awareness of the risk factors and screening options(Abuadas et al., 2018; Omran et al., 2015), while potentially also experiencing financial and logistical obstacles to meeting with healthcare providers routinely (Hammad et al., 2022). Similarly, reduced supportive resources for providers and workloads create barriers to higher provider advocacy for CRC screenings to their patients(Abuadas & Abuadas, 2019; Ahmad et al., 2015).

The location and capacities of screening facilities, alongside the ability of patients to afford the screening and any circumstantial expenses related to receiving the procedure create systemic barriers to Jordanian screenings (Alefan et al., 2017). Lacking national level guidance and interdisciplinary health communication on the national level reduce the ability to manage patient expectations and provide a consistent public health education of risks and benefits to CRC screening options (Al Zoubi et al., 2020; Taha et al., 2019).

Purpose

The intention of this work was to better understand the motivators and barriers to CRC screening as perceived by healthcare providers in Jordan. This was done using a survey of various factors related to the decision-making process and environment that more accurately describe the circumstances responding providers refer patients to colorectal screenings in.

Methods

We conducted a cross sectional survey of 153 primary healthcare providers in two Jordanian health governates that applied Theoretical Domain Framework (TDF) principals to assess multi-level factors that influence their decision to discuss CRC screening with their patient population. The Theoretical Domain Framework (TDF), a social-behavioral implementation framework used to understand the mechanics of specific behaviors, in this case being colorectal cancer screenings. This survey used 12 of the 14 main domains to evaluate the context of practice for Jordanian providers, including *Knowledge, Beliefs in Capabilities, Motivation and goals, Reinforcement, Professional role, Emotions, Social Influence*, and *Environmental Context and Resources*.

Results

Responses showed an overall confidence in the *Knowledge, Skills, and Optimism* domain -based questions with responses indicating lowered confidence in *Emotion, Social Influence, and Reinforcement* domain questions, with significant variations in these domains between physician- and nurse-level providers. The sample included 46% male providers and 54% female providers, with the majority of those responding being physicians (69%). Practice distribution among respondents was 45% in urban areas, 42% in rural areas and 3.9% indicating practice in the Zataari refugee camp. An additional 9.2% described their practice outside of these three areas. A majority of providers (79%) indicated performing 5 or fewer colorectal cancer screening referrals in the past 12 months, providing additional context to the scope of recent experience for respondents.

Conclusion

Responses showed significant differences in knowledge of CRC between providers with different scopes of practice, while demonstrating common attitudes and capacities within the country. Concerns with resources capacities, knowledge levels between provider types, and logistical issues in patient meetings strongly indicated that support for providers and additional public health education measures are needed to improve the acceptability and urgency of CRC screenings in the general public.

Background

Jordan represents a potential starting point for intensifying screening efforts across the region, with a existent cancer registry but documented under-estimation of CRC risk by the surveyed Jordanians (Abuadas & Abuadas, 2019; Taha et al., 2019). There are many structural barriers to CRC screenings at multiple levels of the healthcare system, contributing to low CRC referrals and low CRC screening uptake rates, with one study indicating 9.1% of over 3000 surveyed Jordanians receiving the screening when referred (Ahmad et al., 2015). The predominate barrier to CRC screening in Jordan is indicated to be reduced access to healthcare professionals and lack of public awareness of the disease, resulting in increased late-stage CRC diagnosis and a significantly reduced survival (Alefan et al., 2017; Globocan, 2021a).

In Jordan, as in the larger Eastern Mediterranean, one of the primary barriers to self-advocacy in patients largely stems from an underestimation of personal risk of developing CRC despite awareness of the severity of the disease (Taha et al., 2019). This lack of public health awareness is seen across age groups and extends to a fear of colonoscopy “harms” that discourage seeking out the care. The advice of healthcare providers was seen to be extremely influential in patients agreeing to and receiving CRC screenings (Omran et al., 2015), but the ability of providers to manage immediate patient needs and fully educate patients for preventative CRC screenings are limited by resources available(Taha et al., 2019) and their capacity to manage workloads(Nashat et al., 2020). Adding to the barriers providers experience in encouraging patients to receive CRC screenings, there are few national guidelines for CRC screenings and limited reach of national programs to identify and manage existing cases of all cancers. These systemic factors contribute to inconsistent patient experiences and expectations for the screening, while logistical and financial barriers for rural providers and patients to reach screening facilities create additional concerns ADDIN EN.CITE (Abuadas et al., 2018; Ajlouni et al., 2015; Omran et al., 2015; Spiegel et al., 2020). Clear communication of expectations and needs, both between providers and to patients, is necessary to increase acceptance and understanding of CRC risks and preventative needs.

This study intended to enhance the understanding of the circumstances providers are referring patients to CRC screenings using the TDF principles to highlight the knowledge and skills of these providers while considering their awareness of social and emotional complications that may result in hesitancy of patients.

Methods

Study Design

We conducted a cross-sectional study to assess barriers to colorectal cancer screening as perceived by healthcare providers in primary health care settings in the north of Jordan. The survey tool was informed by the Theoretical Domains Framework (TDF), a social-behavioral framework that assesses multi-faceted barriers to behaviors. The link to the study tool was sent to a group of primary care providers. The health directorates in two governorates in north of Jordan sent the questionnaire to the health care providers in all primary care settings that are managed by the two health directorates. Responses were anonymized at point of collection to maintain participant confidentiality. This study was approved by the Emory University and Jordan University of Science and Technology Institutional Review Boards, with full protocols and consenting documentation provided to ensure the ethical conduct and secure collection and storage of data.

Study population and sample

We surveyed a sample of 153 healthcare providers from primary healthcare centers (PHC) in northern Jordan between January and February 2022. The online survey was shared with providers through their PHC directors. No exclusion criteria were applied to facilitate disseminating the survey to a wide audience of providers.

Survey tool and data collection

Underpinning theory for survey:

The survey was informed by the Theoretical Domains Framework (TDF), a social-behavioral framework that intersects with implementation science and aims to understand individual and cultural motivations and barriers to interventions with the ultimate goal of enhancing their acceptability and penetration within the community and long-term adherence at the individual level (Atkins et al., 2017). While TDF is widely used in behavioral and psychological interventions for its use in altering the mechanics of behavior, the application of the framework holds promise for many public health measures as it is centered on increasing the ease and likelihood of a certain activity by identifying contributing environmental, sociological, psychological, and practical factors. The framework has been used effectively in clinical settings to change sterile procedure practices of clinicians and promote adherence to long-term treatment plans in patients (Phillips et al., 2015). In this paper, the applicability of TDF methods in improving preventative medicine screenings is examined in the context of navigating the provider's perspective on recommending colorectal cancer (CRC) screening to at-risk populations in Jordan, with the intention of developing novel interventions within the region to encourage expanded CRC screening services alongside increased uptake of said service by the general public.

Survey development:

The provider-focused survey included twelve of the TDF domains to assess how healthcare providers perceived barriers to CRC screening. The TDF domains are described below. After development and testing of the survey by RSPH and EMPHNET staff, it was translated to Arabic and back translated to ensure fidelity. Distribution was conducted through the EMPHNET staff in Jordan and the data were saved to a secure, shared drive with RSPH and EMPHNET staff.

Knowledge

Provider's knowledge related to CRC screening was assessed using a set of six questions that gauged understanding of CRC in general, current screening recommendations, screening modalities, and risk factors. In specific, the domain included six questions quantified on a 5-point Likert scale measuring agreement to statements pertaining to lack of knowledge and awareness of protocols. For example, the question “I don’t know enough about screening guidelines for colorectal cancer” was used to understand the working knowledge of providers about the screening guidelines based on a 5-point Likert scale, measuring their agreement with the statement as “Strongly Agree”, “Agree”, “Neutral”, “Disagree”, or “Strongly Disagree”. A stronger agreement with this statement indicated providers felt they had insufficient knowledge, and a stronger disagreement showed providers felt they had sufficient knowledge in the CRC screening guidelines.

Skills

Skills were measured with three questions to measure certainty in provider’s skills in discussing CRC risk and screening with patients. These questions were intended for providers to assess their own abilities from different angles of this skill but showed a variation in responses. Rather than the practical application of the CRC screening procedures, as responding providers would not necessarily be providing the service, this survey investigated the ability of providers to navigate discussions with patients that may be reticent in receiving this care due to concerns or misconceptions of what screening entails. Understanding the skills of those providing referrals to fully advise patients on what to expect in CRC screenings and the necessity of such would be essential to any intervention to increase screening rates. The perception of coworker’s skills in providing screenings was also included in this category to measure provider’s perception of the capacities of their own system. Promoting screenings would necessitate the confidence of providers to engage and discuss CRC screening options using questions as “I am confident in my ability to have discussions about colorectal cancer screening with my patients”.

Beliefs in Capabilities

Beliefs in Capabilities was intended to understand provider's confidence in the capacities of their practice, colleagues, and larger health system to adequately meet the needs of their patients using resources available to them. This confidence was measured using the 5-point scale through five questions like "I would trust a colleague to conduct a colorectal cancer screening for me personally", which specifically was used in regard to the belief of responding providers that the CRC screening test can be conducted consistently and correctly to encourage their own use of services.

Optimism

The faith in the available CRC screening modalities was measured through the *Optimism* domain that focused on the provider's beliefs in the effectiveness of the different modalities in identifying CRC across various risk levels. This domain was used to better understand the perception of differing levels of risk among patients, as well as better understand the provider's belief of possible positive outcomes given screening. Optimism was measured using the 5-point Likert scale using questions like "I believe that screening is effective only for patients at high risk", framed to assess how positive providers felt about different circumstances in which they may refer their patients to CRC screening.

Motivation and Goals

Motivations to recommend CRC screenings were assessed in this domain using four questions, particularly understanding the motivation to choose one modality over another. This domain would mirror the perception of efficacy in different screening modalities and effectivity in broader populations across risk groups. Differing preference for screening methods can be used to create and bolster resources to meet what is most accessible and acceptable to providers. Leveraging provider's view of best practices in CRC secondary prevention will better inform the development of new interventions, ensuring that the new methods is familiar enough to improve the outreach while not being too far outside the comfort and knowledgeability of most providers to dissuade use. The intentions of seeking out different modalities was measured using a 5-point scale, with questions such as "I believe sigmoidoscopy is effective" for each of the three modalities to ascertain a level of preference for each screening method.

Reinforcement and *Memory, Attention, or Decision-making Processes*

External circumstances of CRC screenings, from pre-existing conditions in patients to the national or professional recommendations on screenings, were investigated in this domain to better understand the decision of providers to discuss and recommend screening. These factors present themselves in the process of referring or obtaining a screening through the rationing of available resources to meet the immediate needs for the patient. For example, a chronically ill person may need to decide between receiving care for their specific illness versus a routine CRC screening, and a provider may need to decide between using limited appointment time to discuss treatment of an existing condition over that of a CRC screening once one becomes eligible. Also in this domain is an assessment of the role of system-level factors in screening-related discussions, as national recommendations and guidelines may influence providers to act more decisively on CRC screenings than when left to one's own determination. *Reinforcement* focused on the use of resources to guide provider's decision process in guiding patients through screenings, as in the question "Guidance from the Jordanian Ministry of Health impacts my decision to refer patients for screening". *Memory, Attention and Decision-making processe*s were more focused on the time and practice limitations at play when providers are advising and referring patients for screening, explicitly being issues with workload, patient priorities, and available staffing. Measured in the same 5-point Likert scale as the previous domains, the question “My patient load is too heavy to discuss colorectal cancer screening” is an example of how a provider would need to prioritize other medical needs over beginning a CRC screening routine.

Professional Role

This domain used one question to understand the practical and influential role of healthcare providers in increasing CRC screening participation within their patient populations. *Professional Roles* in this survey navigated the provider’s perceived responsibility in the process of referring and continuing routine CRC screenings, using question such as “There is confusion about whose role it is to discuss colorectal cancer screening” to understand their obligations in professional circumstances.

Emotions

The emotions and personal perception of CRC are structural to understanding any outreach scenario, and in this survey the providers were questioned on the extent of their awareness of emotional effects of CRC screening on their patient population. Emotion, specifically fear, was assessed using “Discussing colorectal cancer screening can cause fear in patients”.

Social Influence

The capacity of providers to participate in and contribute to social discussions of CRC was also examined in anticipation of a potential intervention, as providers would be more educationally and reputationally able to advocate for members of the community to receive CRC screenings when eligible. Awareness of social stigma was measured in this survey using the question “ There is social stigma associated with colorectal cancer diagnosis that prevents patients from getting their screening“, establishing a baseline to better understand the perception of their larger place in the community.

Environmental Context and Resources

The resources and environmental context of providers and the patients seen in their practice were examined in a set of 65 questions as a means of understanding the available infrastructure that influences delivery of care and care-seeking. Expansion of these resources would increase accessibility and affordability of care for the public while preventing an increased workload burden for providers. For example, one of these questions, “There is an adequate number of providers to conduct colorectal cancer screening”, assesses the issue of availability of providers for conducting screening by measuring agreement using the aforementioned 5-point Likert scale.

The two TDF domains on *Beliefs in Consequences* and *Intentions* were not used in this survey, as they were not immediately relevant to understanding provider’s perspectives. *Belief in Consequences*, in this case is irrelevant because the belief of consequences of not performing CRC screening is reliant on the knowledge of providers, and would be redundant (Atkins et al., 2017; Kanth & Inadomi, 2021). From the provider’s perspective the primary consequences of receiving CRC screening should be the awareness of one’s health status, and as additional treatment access was not the focus of this survey it was deemed irrelevant to the current study. Similarly, the *Intentions* domain was deemed irrelevant to the current research question as providers would follow a criterion to determine eligibility for screening and the decision process is better addressed using the *Knowledge* and *Motivation and Goals* domains to understand the choices one makes within CRC screenings.

Divisions between provider groups

Responses were recorded and presented as a percentage of respondents in their respective licensure group. Agreement was then condensed from a 5-point Likert scale to a 3-point scale (Agree, Neutral, Disagree). Alignments in respondent groups were identified, specifically in the nurses and midwives, as well as between the physicians and specialists. These alignments represented different understandings in multiple Using the 3-point scale, responses in these two groups (Nurses & Midwives, Physicians & Specialists) were represented together in Table 4 to better show the differences in responses. Responses within these groups did not show significant variation within the adjusted scale, but further highlighted different perspectives between the levels of providers.

Non-TDF variables

Practice Setting

The practice setting was surveyed in respondents, distinguishing between those practicing in urban or rural areas, or clarify a third setting one may practice within. This question was used to understand where providers of different specialties were located in Jordan and allowing for a better understanding of additional settings that were reached through the survey. The “other” category was used to encapsulate those in private practice outside of distinct urban or rural areas, or those that practice outside of the defined settings.

Profession

The specific profession or specialty of different providers was measured to understand the scope of practice reflected in the responses, with the distinction between family and general physicians, nurses, and specialty physicians. Other providers were also recorded, and the specification of these additional providers was used to understand the further reach of the survey than anticipated and leverage this information to better understand the medical infrastructure in Jordan.

Recent screening referrals

The number of referrals performed by providers in the past 12 months was surveyed, using a 5-item range to understand approximately how frequently a given respondent made a CRC screening referral recently. The frequency was important to understand, as those with less experience in the screening process would more likely be an ideal target to reach for education and materials distribution because their patients would be less likely be aware of their risk and the necessity of regular screenings. This question served to reference the TDF questions that focused on providers' ability to communicate and educate their patients, as well as the patient's understanding of CRC risks. Understanding the general trends in screening referrals within the responding population allowed for better context as to the CRC practice experience in this group, further contextualizing the providers' perceptions.

Data Collection:

This survey was carried out virtually. Respondents were contacted through the EMPHNET communication network by email and provided a link to the survey hosting site, which allowed respondents to answer questions at their own pace wherever they were. The link to the study tool was sent to a group of primary care providers. The health directorates in two governorates in north of Jordan sent the questionnaire to the health care providers in all primary care settings that are managed by the two health directorates. Responses were limited to those able and willing to use the online survey platform, as well as have the time to complete the survey in addition to their daily workload. This mode of distribution provided a wider location reach, particularly in the setting of a pandemic, and access to a wider range of provider's perspectives than may be available with an in-person survey requiring more extensive manpower and cost. Virtual distribution also carried the advantage of allowing real-time viewing of responses, which gave study staff the ability to understand the rate of response in those contacted and potential issues with responses based on ongoing trends in the data.

Data Management and Statistical Analysis

Data management and analysis were conducted at RSPH. Surveys were conducted completely anonymously through the online platform, with results collected on a shared drive from January 30th to February 21st, 2022. Following data collection, responses were back translated from Arabic to English and data was cleaned for analysis. Descriptive statistics were used to analyze respondent characteristics and the trends in responses across TDF questions. Summary statistics was performed using SAS Studio (SAS software, Version 3.81. Copyright © 2018 SAS Institute Inc. Cary, NC, USA.). No statistical testing was conducted because of the descriptive nature of the study.

Results

Participants' characteristics

This study included 153 primary care providers (54% males and 46% females). Of those, 45% were working in urban areas, 42% in rural areas, and 4% in refugees setting, with 9% stating their practice took place outside of these three stated settings. The majority of respondents were physicians, with general and family physicians collectively accounting for 56% of the contacts. Specialists made up 13% of respondents, practicing at a physician-level of licensure outside of General or Family Practice specialties. Nurses constituted 12% of respondents, and midwives represented 11%. The category of "other" was also included to encapsulate those outside of these categories practicing in healthcare, 9% of respondents specified their practice outside of the above-mentioned categories. (Table 1)

Barriers to colorectal cancer screening as perceived by healthcare providers

Knowledge

Physicians and specialist respondents attested to having a high overall knowledge, with the majority stating knowledge of CRC screening guidelines(77%), screening modes (85%) and risk factors (66%). These responses were reversed in nurses and midwives, with the majority responding attesting to a lack of overall CRC knowledge (69%), knowledge of CRC screening guidelines (66%), screening modes (69%), and risk factors (63%). The difference in responses represented the most significant divergence in perceptions between respondents, critically with the highest separation between the groups. [Table 2]

Skills

Skills measured in this survey focused on the capacity of providers to discuss and promote CRC screenings, understanding that all providers would not necessarily conduct the screenings but could participate in identifying and referring patients to such screenings. The majority of both professional groups stated confidence in adequately discussing CRC screenings with patients (51% of Nurses & Midwives, 77% of Physicians & Specialists). However, the majority of both of these groups also reported difficulty in explaining CRC screenings with patients (89% of Nurses & Midwives, 100% of Physicians & Specialists). [Table 2]

Beliefs in Capabilities

Provider's beliefs of the capabilities of different facets of the Jordanian healthcare system to support CRC screening were measured across five questions, all which indicated very strongly that providers were confident in each facet of the system. The majority of respondents attested to belief in that CRC screenings are both necessary (90%) and effective (83%), with the majority of both professional groups following this overall majority. Similarly, over 72% in each grouping agreed that effective early treatment is possible in most patients (74% of Nurses & Midwives, 78% of Physicians & Specialists). Additionally, while the overwhelming majority attested to trusting colleagues to conduct their own screenings (86% of Nurses & Midwives, 95% of Physicians & Specialists), significantly fewer attested to having confidence in colleagues' ability to conduct CRC screenings (46% of Nurses & Midwives, 28% of Physicians & Specialists). [Table 2]

Optimism

The majority of all respondent groups found that screening is effective for average risk (72% overall) and high risk (98% overall). These questions were intended to measure how screening was perceived as relevant for different risk groups, as this would alter the urgency of arranging the screenings. In contrast to this the majority of physicians and specialists disagreed that early detection of cancers is easier to treat (59%), while nurses and midwives were more split across responses with 37% in disagreement. [Table 2]

Motivation and goals

The CRC screening choice represented part of the goals to respondents making CRC screening referrals, as providers would be unlikely to refer patients to screening methods they felt would be ineffective and inefficient. The separation of professional groups showed that a larger majority found sigmoidoscopy to be effective (57% of Nurses & Midwives, 51% of Physicians & Specialists) in comparison to colonoscopy and FOBT. Respondents showed that there was a slight difference in perception of colonoscopy, with 46% of nurses and midwives agreeing to its effectivity compared to 40% of physicians and specialists. FOBT had the greatest percentage of providers remaining neutral in regard to effectiveness (49% of Nurses & Midwives and 47% of Physicians & Specialists) neither agreeing nor disagreeing to the methods effectiveness. [Table 2]

Reinforcement

The *Reinforcement* domain questions reflected the scope of practice among respondents, specifically in regard to CRC screening guidelines and the application of these guidelines in making CRC screening recommendations. Respondents in the Physicians and Specialist group attested to the influence of Jordan's Ministry of Health (64%), while also agreeing that the guidelines available changed frequently (67%). Nurses and Midwives attested to seeing similar changes as well, with 43% in agreement. The responding nurses and midwives also agreed to Ministry of Health influence at a lesser extent than their counterparts, with 34% agreeing and 43% remaining neutral. [Table 2]

While the majority of nurses and midwives attested to having no defined protocols for screening within their workplace (66%), in line with the scope of their treatment responsibility, while physicians and specialists responding to the same question had a more defined split. Of the respondents in this group, 48% attested to having no defined CRC screening protocol in their workplace while 34% indicated there was an existing protocol available to them. Overall, the majority of respondents agreed that there is a lack of distributable materials for CRC screenings to educate patients (74% of Nurses & Midwives, 82% of Physicians & Specialists).

Memory, Attention, or Decision-making processes

This survey focused on measuring how practice responsibilities and patient needs affect the decision of providers to recommend CRC screening at a given interaction, with the goal of incorporating screenings into more routine care. The majority of respondents agreed that time limits restricted ability to discuss screenings (74% of Nurses & Midwives, 90% of Physicians &

Specialists) and their respective patients were more likely to seek urgent care than routine screening (51% of Nurses & Midwives, 51% of Physicians & Specialists). Interestingly, the majority of respondents did not agree that patient loads were too heavy to discuss CRC screenings, although it was the largest response group regardless (49% of Nurses & Midwives, 47% of Physicians & Specialists).

Behavioral Regulation

Regarding the *Behavioral Regulation* domain, this survey focused on accessibility of national guidelines to providers. The majority of both provider groups agreed that there are no national guidelines they are able to use (54% of Nurses & Midwives, 59% of Physicians & Specialists). [Table 2]

Professional role

While the majority of providers agreed that there was confusion as to who should lead CRC screening discussions, there was significant differences between professional groups. The majority of nurses and midwives found that there was confusion (51%), while 40% chose to remain neutral. These responses contrasted with the 75% of physicians and specialists that agreed to the presence of this confusion, with no comparable groups in other responses. [Table 2]

Emotions

While limited in scope, *Emotions* domain showed that there is some uncertainty in the perspective of providers on how their patients feel about colorectal cancer discussion. Responses indicated there was no majority opinion of whether the discussion of CRC caused fear in patients among the respondents, with 34% of nurses and midwives agreeing and 31% disagreeing. This held true as well in the physicians and specialist group, with 34% agreeing that the discussion of CRC caused fear while 42% disagreed. [Table 2]

Social Influence

The social perception of colorectal screenings, from what providers understand of it, was shown to have significant differences based on the providers' level of practice. While 63% of nurses and midwives agreed that discussion of CRC screenings carries social stigma, only 40% of physicians and specialist agreed while 38% in this group chose to remain neutral. [Table 2]

Environmental Context and Resources

Screening availability and resources measured in this survey indicated that the availability of specific screening methods affected how providers made screening decisions for their patients(54% of Nurses & Midwives, 73% of Physicians & Specialists), and that a larger percentage of providers believed there to be sufficient staff to conduct colonoscopy (46% of Nurses & Midwives, 67% of Physicians & Specialists). Of the responding providers, there was a more unclear decision as to if testing was close to where patients lived, with 45% of physicians and specialists disagreeing as the most definitive response. [Table 2]

Discussion

This survey implemented the TDF to better understand the circumstances of CRC screenings in Jordan from the provider's perspectives. Use of the TDF domains allowed for the multi-faceted understanding of the context of CRC screening decision making within the Jordanian healthcare infrastructure. This approach was especially important as the conditions that providers make decisions and practice in is under-represented in available literature and essential to development of best-practices and improved outcomes in Jordan. Domain-related questions showed a distinct confidence in the capacities of providers in terms of knowledge and medical ability to discuss and recommend CRC screening, with over 50% of respondents disagreeing that lack of knowledge on CRC screening needs and protocols was a limiting factor in screening rates, and over 70% agreeing that the routine use of screening in any mode provided meaningful reduction of CRC incidence. Comparing the knowledge seen in prior studies in the EMR and that in this survey showed a distinct separation, with the surveyed providers stating a high level of knowledge on CRC screenings while similar studies showed a mostly low awareness in the patient population, with over 45% unable to identify their risk (Nasaif & Al Qallaf, 2018) in a cross-sectional study. While these studies represented two very different groups, it further highlights the disparity in CRC screening awareness in the general public of Jordan is not due to deficiencies in healthcare provider training. Other domains supported this illustrating better the disconnect between healthcare providers and the population. The *Reinforcement* domain, for example, showed a lack of national regulations and distributable materials for patients in line with regional concerns over the lack of clear guidance on screening procedures and accessibility of care (Ajlouni et al., 2015; Maha El-Rabbat, 2020) [Table 2]. *Decision-making and Social Influence* domains showed responses in line with obstacles to routine screening and patient education that most directly impact providers; most notably time restraints to meetings and divisions between clinical settings and social awareness campaigns.

The *Reinforcement* category highlights the provider's difficulty in navigating the national protocol standards surrounding screenings, specifically asking of the national-level standardization of care in Jordan. National-level guidelines and educational materials provide a starting point for providers to coordinate care for patients as they travel across Jordan without significantly disrupting care and give patients understanding of what they can reasonably expect from competently conducted CRC screenings. This standardization allows patients to be involved in advocating for themselves and improves the ability of members of the public to become more comfortable with CRC screenings. In a similar vein, *Social Influence* responses showed providers believe they have a reduced influence in promoting CRC screening discussion and acceptance outside the clinical environment. While this shows the need to improve patient education abilities in providers to bolster this confidence, it also introduces the potential for a third-party, non-clinical initiative to improve awareness to reduce the burden of education on providers. [Table 2]

Overall, domains based on professional and personal capabilities scored significantly higher than those based on the emotions and social interactions of the larger community. This reflects in the local barriers as primarily emotion and socially based rather than educational [Table 2] although a significant note on this similarity is the higher rate of "neutral" responses in the domain questions. The use of this response choice, which averaged above 10% in every category, indicates a significant uncertainty for respondents across the domains on many of these domains. The *Emotion* and *Social Influence* domain responses reflect trends in the EMR, showing the social concern over CRC and screening methods (Kulhánová et al., 2017). This is beneficial to understanding the generalizability of these findings across Jordan and allow for a baseline of social and individual concerns that can be developed through future surveys.

The study population for this survey was limited to those healthcare providers in Jordan that could be contacted virtually with through the EMPHNET survey mechanism. Due to the limitations of this population the results are not generalizable to the wider range of Jordanian healthcare providers, but it provides a useful understanding of the potential for this survey tool to better address the perceptions and concerns of providers in later iterations of the survey. The use of those able to respond virtually was particularly important in light of COVID-19 restrictions, as similar assessment surveys may be necessary for providers in the future if similar such restrictions are put into effect. Providers specifically were considered to be an ideal audience for this survey due the to the professional reputation as a trusted source, as this group would be at the forefront of any CRC screening interventions implemented in the country and would be immediately pivotal to the success of any such endeavor. Expanded provider support would be essential to improving the educational outreach and understanding of existing CRC screening measures, as the prior studies show that public knowledge of CRC is lacking even if this is not also true of the medical provider community(Taha et al., 2019). As shown in survey responses regarding the *Environmental Context* and *Decision-making process* domains as well as prior assessments of provider needs in the region (Rababah et al., 2018), expanding the available resources would be necessary to allow this increase in responsibilities for providers.

Recommendations

This study investigated the current circumstances of CRC screening in Jordan from the perspective of providers, specifically focused on their awareness of risk and capacities within the existent health system. Representing these conditions gives significant insight into the shortfalls of current healthcare infrastructure and application in Jordan and gives a preliminary concept of where novel interventions should be focused to improve CRC screenings. In future surveys an expanded survey audience would be useful to better understand the perceptions related to CRC screenings, as the limited scope of this survey does not allow for generalizability to the whole of Jordan’s medical practitioners. Development of future investigations and interventions should use the different scope of practices in different provider occupations, as the distinction between different settings would necessitate different approaches to application of new CRC screening interventions. Cross-dimensional analysis of domains would be the next step to seeking the distinct differences in professions and would be bolstered by additional data from all five main provider occupations that were seen in this survey. Increasing the comfort and connectivity between providers and the public would improve this as well, increasing the abilities of these providers to communicate effectively and persuade the community to seek out and maintain routine screenings.

The responding population was limited due to the shorter timeframe and limited extent of the contact network, with those without convenient access to the EMPNET communications and the online survey itself restricted these responses from being captured. However, the distribution of the survey virtually allowed this study to reach a higher number of providers in a shorter period during COVID-19 pandemic circumstances and allowed for timely outreach across a larger than in-person distribution would make possible. Utilizing the providers optimistic view of the safety and reliability of all screening modalities to assuage the concern of patients that they have seen could be instrumental in creating a more open conversation of the risks and prevention of CRC in the Jordanian public. This would necessitate a training on health communication for willing providers, as the social influential abilities of the surveyed providers was indicated to be lower than ideal to be providing non-clinical advocacy.

Conclusions

This study shows the effectiveness of using TDF to evaluate the perceptions and practical resources providers may face while advocating for increased CRC screenings in Jordan. The multi-faceted approach allows the gaps in the practice, specifically in social and psychological aspects, to become more apparent. Use of this survey instrument was limited as it was distributed virtually, and later iterations may indicate changes to the primary domain findings as the population reached shifts. Despite this, the applicability of TDF was shown in this setting and the use of the virtual distribution to obtain coherent results showed the potential as an evaluation tool in pandemic restriction circumstances. Future comparisons to expanded provider populations and a similar survey aimed at the general public would provide a well-rounded approach for the development of novel interventions in Jordan and sets a solid foundation to understand the best approach to control CRC for the larger Eastern Mediterranean region.

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Table 1 – Characteristics of the study population (N%)

Characteristic	**N (%)**
Gender	
Male	*71 (46%)*
Female	*82 (54%)*
Role	
General Physician	*36 (24%)*
Family Physician	*49 (32%)*
Specialist	*20 (13%)*
Nurse	*18 (12%)*
Midwife	*17 (11%)*
Other	*13 (8.5%)*
Location	

Rural	*64 (42%)*
Urban	*69 (45%)*
Refugee	*6 (3.9%)*
Other	*14 (9.2%)*
CRC Referrals in the past 12 months	
0-5	*121 (79%)*
6-11	*16 (10.5%)*
12-16	*8 (5.2%)*
17-20	*7 (4.5%)*
Greater than 20	*1 (0.7%)*

Table 2 – Percentage of provider agreement to questions within domains of the Theoretical Domains Framework (TDF)

Domain	**TDF Questions**	Roles					
		Nurse/Midwife			Physicians/Specialists		
Knowledge		Agree	Neutral	Disagree	Agree	Neutral	Disagree
	I don't know enough about colorectal cancer	24	7	4	11	12	82
		69%	20%	11%	10%	11%	78%
	I don't know of any national guidelines for screening	23	7	4	13	11	81
		66%	20%	11%	12%	10%	77%
	I am familiar with common recommendations for CRC screenings	23	9	3	10	8	87

		66%	26%	9%	10%	8%	83%
	I am familiar with multiple CRC screening modalities	24	5	6	9	7	89
		69%	14%	17%	9%	7%	85%
	I am aware of the risk factors for CRC	22	6	7	16	20	69
		63%	17%	20%	15%	19%	66%
Skills	I don't know enough about the screening interval for colorectal cancer (e.g., annual basis vs. other intervals)	23	7	4	16	20	69
		66%	20%	11%	15%	19%	66%
	I am confident in my ability to have discussions about colorectal cancer screening with my patients	18	11	4	81	12	12
		51%	31%	11%	77%	11%	11%
	I have difficulty explaining colorectal cancer screenings to patients	31	3	0	105	0	0
		89%	9%	0%	100%	0%	0%
Belief in Capabilities	I believe that cancer screening recommended by a provider is necessary	29	4	1	95	8	2
		83%	11%	3%	90%	8%	2%
	I believe that colorectal cancer screening is effective	24	7	2	90	11	4
		69%	20%	6%	86%	10%	4%

	I have confidence in my colleagues' ability to conduct colorectal screenings	16	7	10	29	16	60
		46%	20%	29%	28%	15%	57%
	I trust my colleagues to conduct my screening	30	4	0	100	2	3
		86%	11%	0%	95%	2%	3%
Optimism	Effective early treatment is possible for most patients	26	8	0	82	19	4
		74%	23%	0%	78%	18%	4%
	I believe that screening is effective for patients that are asymptomatic and of average risk	23	10	0	76	19	10
		66%	29%	0%	72%	18%	10%
	I believe that screening is effective only for patients at high risk	32	1	1	103	1	1
		91%	3%	3%	98%	1%	1%
Motivation and goals	I believe that early cancer detection makes the cancer easier to treat	10	10	13	10	33	62
		29%	29%	37%	10%	31%	59%
	I believe that colonoscopy is effective	16	14	5	42	43	20
		46%	40%	14%	40%	41%	19%
	I believe that sigmoidoscopy is effective	20	9	5	54	38	13
		57%	26%	14%	51%	36%	12%

	I believe that Fecal Occult Blood Testing is effective	14	17	4	38	49	18
		40%	49%	11%	36%	47%	17%
Behavioral Regulations	There are no national guidelines that I can use	19	10	5	62	22	21
		54%	29%	14%	59%	21%	20%
Reinforcement	Guidance from the Ministry of Health impacts my screening recommendations	12	15	6	67	16	22
		34%	43%	17%	64%	15%	21%
	Guidelines for screening keep changing	15	13	5	70	18	17
		43%	37%	14%	67%	17%	16%
	There is no defined protocol for screening referrals at my workplace	23	6	5	50	19	36
		66%	17%	14%	48%	18%	34%
Social Influence	There is a lack of colorectal screening material to share with patients	26	7	1	86	14	5
		74%	20%	3%	82%	13%	5%
	Colleagues' practices affect my decisions on recommending screening	12	15	6	25	36	44
		34%	43%	17%	24%	34%	42%
	There is social stigma associated with colorectal cancer diagnosis that prevents patients from getting their	22	9	3	42	40	23

	screening						
		63%	26%	9%	40%	38%	22%
Professional Role	There is ambiguity about whose role it is to discuss colorectal cancer screening	18	14	2	79	20	6
		51%	40%	6%	75%	19%	6%
Environmental Context	Screening test availability in the surrounding area impacts my decision to refer patients to screening, and in what modality	19	9	5	77	20	8
		54%	26%	14%	73%	19%	8%
	There is an adequate number of providers to conduct colorectal cancer screening	16	12	6	70	18	17
		46%	34%	17%	67%	17%	16%
Emotion	Patients are able to receive colorectal cancer screening close to where they live	7	16	10	22	36	47
		20%	46%	29%	21%	34%	45%
Memory, Attention, or Decision-making processes	Discussing colorectal cancer causes fear in patients	12	9	11	36	25	44
		34%	26%	31%	34%	24%	42%
	My patient load is too heavy to discuss colorectal cancer screening	17	8	9	49	32	24
		49%	23%	26%	47%	30%	23%

	The duration of the scheduled visit is too short to allow a discussion of colorectal cancer screening	26	8	0	94	10	1
		74%	23%	0%	90%	10%	1%
	My patients are more likely to seek urgent care than have routine visits	18	9	7	54	19	32
		51%	26%	20%	51%	18%	30%

Chapter 4: Discussion

Discussion

This study provided baseline input necessary for the design of novel approaches to develop and improve on CRC screening efforts in Jordan. The specific goal of the work was to understand the knowledge, perceptions, and practices around CRC prevention and screening among healthcare providers in the country. The assessment tool was designed using a comprehensive framework, the Theoretical Domains Framework, to enable the identification of less obvious barriers to CRC screening, beyond what has been established in the existing literature. Previous studies indicated that healthcare trainees had significant knowledge of CRC risk factors and symptoms (Rababah et al., 2018), but did not address the capacities for implementation in regular practice. While adequate knowledge is essential, managing complex social and personal perceptions of CRC is central to improving the acceptability on a personal and societal level. This study investigated factors beyond individual provider's knowledge and awareness, such as social, logistical, and emotional aspects, that are essential to promoting and recommending CRC screening. While the limited population of this study – providers in primary healthcare centers – prevents further generalization to other settings, the proof of concept allows for improvement of the survey instrument and administration process for future iterations in Jordan and other countries in the EMR. This study focused on healthcare providers and their experiences and attitudes surrounding CRC to improve understanding of this population, with the goal of comparing these findings to future surveys of the general public. Expanding understanding of the provider population within Jordan can highlight the mechanics of receiving CRC screenings to identify barriers.

TDF-related questions showed a distinct confidence in the capacities of providers in terms of knowledge and medical ability to provide the CRC screenings, with over 50% of respondents disagreeing that lack of knowledge on CRC screening needs and protocols was a limiting factor in screening rates. [Table 2] The focus of this survey on healthcare providers specifically allowed for the distinction between professional and public levels of understanding CRC risks. Interestingly, data stratification showed that physicians (internists and specialists) were more likely to have confidence in their CRC-related knowledge compared to nurses and midwives. Responses showed that there is an important gap in CRC knowledge and ability to communicate this information to patients, indicating that health communication skills and available resources to facilitate patient education are not sufficient at the time of this study. While respondents were not all likely to be conducting CRC screenings or referrals themselves with the majority (79%) attesting to performing fewer than 5 referrals in the past year, these providers are important social resources for their community and are important to ensuring future outreach programs are trusted and successful in Jordan.

The *Reinforcement, Memory, Attention, and Decision-making processes, and Social Influence* domains all showed obstacles to routine screening and patient education as to their personal risks. The *Reinforcement* category highlighted the need for better national standards and protocols to support consistent care across health facilities and practitioners. *Social Influence* responses showed providers believe they have a reduced influence in promoting CRC screening discussion and acceptance outside the clinical environment, potentially a reflection of the gap in public health education for CRC in the existing Jordanian social sphere. While the *Emotion* domain had a limited role in this survey, responses indicated that most providers observed fear surrounding CRC diagnosis in their patients which contributes to difficulty in broaching the topic that would be best approached in conjunction with the *Social Influence* concerns. *Memory, Attention, and Decision-making processes* indicated logistical barriers to receiving screening on both the provider and patient sides, with providers reporting time and resource constraints alongside attending to other priorities in their patients. The patient-led prioritization of acute and emergent rather than routine healthcare in their meetings with providers, as indicated in these responses, indicates a lack of regular access. This difference in priorities during patient-provider meetings highlights the need to use a more proactive effort in arranging CRC screenings as people enter the recommended age range of 45-75 years old, as the current opportunistic method of outreach relies on patients' ability to access healthcare at least as regularly as screening intervals.

The responses highlighted the social and psychological barriers involved with CRC screening in Jordan at this point in time, much of which can be addressed in better risk education of patients and increased supportive health infrastructure. Consistent and accessible resources for CRC screening and treatment could be applied on a national level in line with the Jordanian universal healthcare goals (Hammad et al., 2022) but would necessitate nationally applied guidelines for initial and subsequent screening as well as increased staffing to properly dedicate resources. Increasing public health education on CRC screening would not necessarily require the same level of education and staffing as improving supportive care to existing cancer patients (Al-Husban et al., 2021), but would necessitate better supports to providers performing screenings as they would likely have an increased workload with the newly referred patients. Dedicated health education workers would also be able to serve as a reliable source for providers to refer back to in the event of uncertainty, allowing a more detailed advisement and case management than is currently realistic for most providers.

As shown in survey responses regarding the *Environmental Context* and *Decision-making process* domains showing limited resources and time spans providers are able to meet with patients as well as prior assessments of provider needs in the region (Al Zoubi et al., 2020; Al-Husban et al., 2021), expanding the available resources would be necessary to allow this increase in responsibilities for providers. Improving on the capacities of healthcare providers to better manage CRC resources would also require bolstering existing cancer registry programs, allowing for better communications and management of national resources to improve case identification and need-based resources. This effort would be supported through findings from future surveys that address the availability and accessibility of healthcare resources within the country. The data obtained can be used to focus novel interventions to leverage existing strengths within the country, like CRC-knowledgeable general practitioners and available interprofessional and administrative organizations to better standardize CRC screening experiences for patients.

The majority of respondents indicated an awareness of social stigma and fear around colorectal cancer and screenings, providing context to their awareness of patient concerns and possible sources of hesitancy. Along with confirming the presence of this barrier in the Jordanian population, the acknowledgement from providers supports that this is a common enough issue in referring CRC screenings to warrant addressing. While this represents a surface understanding of the concerns, providing the tools to normalize preventative care and alleviate misconceptions should be the goal of future efforts to act on the survey results.

Strengths & Limitations

Due to the small study sample and survey distribution, there are significant limitations to the generalizability of the results. Specifically, this study focused exclusively on healthcare providers working in Jordan and was limited in reach to those accessible by the EMPHNET communication network. The limitation in reach was attributed to the electronic distribution of the survey, necessitated by COVID-19 precautions and time constraints. An in-person administration of the survey might contribute to a more inclusive sample of Jordanian providers, representing those less inclined to respond electronically and providers not receiving EMPHNET communications.

This study strengthened the understanding of CRC screening barriers in the EMR by gaining a provider's perspective of CRC screening, which previously existed as a gap in the research. Understanding this portion of the population provides an inlet to managing the patient experience as seeking CRC screenings, as providers generally control the access to screening procedures and any resultant care needed. This study also showed a significant difference in the practice of providers by role, with general practitioners indicating urban practice setting as well as attesting to a significantly higher confidence in knowledge and training than nurses and midwives. Differentiation of practice areas and patient populations would provide a better understanding of the extent of this knowledge, as providers who have an established group of older patients may have more experience with CRC-related topics than a provider who sees a less consistent or younger patient base.

Recommendations

Development of future investigations and interventions should use the different scope of practices in different provider occupations, as the distinction between different settings would necessitate different approaches to application of new CRC screening interventions. Cross-dimensional analysis of domains would be the next step to seeking the distinct differences in professions and would be bolstered by additional data from all five main provider occupations that were seen in this survey. This understanding could be beneficial to engaging in public health education outside of a clinical setting, with special attention paid to lower socioeconomic populations that may not have equitable access to colorectal health advise and screenings.. Additionally, surveying providers active in refugee settings specifically would improve overall awareness of the circumstances as this group was underrepresented and potentially represents a long-term, high-risk group living in Jordan without consistent access to medical care because of their living situation.

An expanded provider population would be highly beneficial to improving data in later surveys, and interprofessional approach over a longer time period may be beneficial to reaching a further geographic area than was available in this iteration of the study. Later, the use of a similar survey instrument should be used for the general Jordanian public in order to complete the understanding of CRC circumstances. This would allow for a comparison of perceptions from multiple aspects of the CRC screening process and develop intervention to suit these needs, while leveraging positive influences identified.

Conclusions

Despite the limitations of this study, it demonstrates a route to better understanding the existing limitations to CRC interventions in Jordan and in the EMR. Using the TDF domains allowed for a better insight into the barriers and motivators Jordanian providers experience in assessing patients' risk and eligibility for CRC screenings. In this case particularly, the scalability and modification based on new information is essential to improving the CRC survival rate in the EMR. Responses showed a deviation from the existing literature regarding awareness of CRC in Jordan, providing a foundation to understanding the perceptions and attitudes surrounding CRC in the country and the larger Eastern Mediterranean region. This study was also able to show the significant differences in healthcare provider areas of practice, allowing for a more refined understanding of knowledge and capacities across the population and potential routes for novel interventions. Although limited in scope, the ability of this survey to focus in on the unique perspectives of Jordanian provides a benefit to future investigations into improving CRC screening and care options for those across the EMR.

While future iterations of this study will likely modify the survey instrument administration and audience to better serve CRC screening efforts in the country, the conditions of this study indicate useful information can be gathered even during pandemic restrictions and existing communication networks. Future comparisons to expanded provider populations and a similar survey aimed at the general public would provide a well-rounded approach for the development of novel interventions in Jordan and sets a solid foundation to understand the best approach for the larger Eastern Mediterranean region.

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