ATTITUDES AND PRACTICES AMONG PHYSICIANS REGARDING LIFESTYLE INTERVENTIONS FOR PATIENTS WITH TYPE 2 DIABETES

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ABSTRACT- BACKGROUND: Family physicians play a major role in diabetes management. Studies in Saudi Arabia on the attitudes and practices of family physicians regarding diabetes management, including lifestyle interventions, are very limited. OBJECTIVES: To examine family physician attitudes and practices regarding lifestyle interventions for patients with diabetes, and to determine the doctors' perceived barriers to lifestyle interventions. METHODS: A cross-sectional design was used to study 196 family physicians between September and October 2016. Physicians taking care of patients with type 2 diabetes (T2D) were conveniently recruited from 3 primary care centres located in Eastern Province, Saudi Arabia. A structured, self-administered questionnaire was used to collect information. A 'positive' attitude was defined as having a score ≥ median. RESULTS: Out of 196 physicians, 115 (58.7%) were males and the mean age was 39.8±5.8 years. Positive responses to the 10 attitude questions ranged between 52.0% and 86.0%, with an average of 79.0%. Frequent referral (>10 times during the last 6 months) to dietitians was 63.8% and to other specialized services ranged between 0.0% and 4.6%. The overall 'frequent referral' mean of 60.0% ranged between 40.0% and 73.0%. Frequent referral to weight loss programs was significantly associated with positive attitudes towards lifestyle interventions for patients with diabetes (p=0.004) while frequent referral to endocrinologists or diabetologists was significantly associated with 'negative' attitudes (p=0.007). The majority of the physicians reported the following items as barriers for the initiation of lifestyle counseling among their patients: busy doctor's schedule (97.4%), non-cooperative patients (97.4%), lack of resources such as educational materials to take away (96.9%), lack of multidisciplinary team communication (94.9%), poor patient adherence with scheduled visits (93.9%), and lack of referral pathways (93.4%). CONCLUSIONS: There is a generally positive attitude towards lifestyle interventions but relatively low referral practices among a sample of family physicians caring for patients with T2D in Saudi Arabia. Several system and patient barriers have been reported to limit both the initiation and effectiveness of lifestyle counseling. The current findings can be potentially helpful in identifying the components required for establishing a local improvement initiative to promote lifestyle counselling and referral practices.

I. INTRODUCTION

Lifestyle interventions are distinct components in the management of diabetes. Studying the factors that influence them in a primary care setting is both feasible and potentially productive. Given the significant role played by family physicians in diabetic management, it is important to evaluate their attitudes and practices regarding lifestyle interventions. Additionally, examining the association between positive attitudes and adherence to recommended practices will give us a better understanding of the challenges to the implementation of lifestyle interventions.

Moreover, determining the physician-perceived barriers to lifestyle interventions as well as predictors of better adherence to recommended practices can potentially help to improve the implementation of lifestyle interventions and probably overall diabetic care in the primary care setting. Finally, examining physician attitudes and practices regarding lifestyle interventions as well as determining perceived implementation barriers are particularly relevant in Saudi Arabia, where the risk of diabetes is high and clinical management practices are suboptimal.

II. AIM OF THE STUDY

The overall aim of this survey is to explore physician attitudes and practices regarding lifestyle interventions, as well as determining the perceived implementation barriers which are particularly relevant in Saudi Arabia.

III. OBJECTIVES OF THE STUDY

1. To assess the attitudes and practices regarding lifestyle interventions among family physicians taking care of patients with T2D in a primary care setting located in Eastern Province, Saudi Arabia.
2. To examine the association between positive beliefs and adherence to recommended practices among these family physicians.
3. To identify perceived barriers to lifestyle interventions among these family physicians.

IV. METHODS

This was a cross-sectional study with data collected through a paper-based questionnaire. The study was

conducted at primary care clinics of the Armed Forces Hospital located in the Eastern Province of Saudi Arabia. The three centres are located in Dharhahn, King Abdulaziz Airbase (150 family physicians), King Fahad Complex Hospital (200 family physicians) and Jubil City Hospital (150 family physicians). We have chosen these three centres as they conveniently have a large number of family physicians available. Approximately 500 physicians run all the centres in three shifts, starting from 7:30 AM until 11:30 PM, 7 days a week. Each morning, between 30 to 50 doctors attend a meeting for 60 minutes to discuss cases or clinical topics. This collection of centres is one of five major Armed Forces Hospitals distributed across Saudi Arabia. These hospitals provide primary to tertiary care services for military personnel, their dependents and eligible civilian patients. Studies on the attitudes and practices of family physicians in Saudi Arabia regarding diabetic care are very limited. A local study estimated agreement on a Likert scale for knowledge, attitudes and practices of diabetic care among family physicians in the Eastern Region as 67% [32]. Therefore, we made the assumption that the frequency of positive attitudes and/or appropriate practices will be approximately 70%. Assuming a frequency of 70% with two-sided confidence limits of 5%, 323 physicians were needed to be surveyed, using an 80% power level and 95% two-sided significance level. The equation used was

$$N = \frac{Z^2_{\alpha/2} * P * (1-p) * D}{E^2}$$

where:

- Zα/2 is the normal deviate at a level of significance = 1.96
- P is the hypothesized % frequency of adherence, which was set at 70%
- E is the desired precision (half the desired CI width), which was set at 5%, and
- D is the design effect, which is usually set to 1 in cross-sectional studies.

However, since the population was very small (N=500), the adjusted number was estimated at 197 physicians using the equation n(adj) = (Nxn)/(N+n), where N is the population number (500) and n is the required sample size. The sample size calculation was done using the OpenEpi internet-based program (http://www.openepi.com/Menu/OE_Menu.htm).

Inclusion criteria:

- Family physicians working in primary care centres of the Armed Forces Hospital in Eastern Province
- Any job title, educational level, postgraduate training or nationality.

Exclusion criteria:

- Physicians with no clinical responsibilities (i.e. having administrative jobs) or with diabetic care responsibilities for less than 6 months
- Other diabetic health care professionals including endocrinologists, dieticians, health educators and primary care nurses.

Since the number of physicians working at the proposed sites is small, we invited all the physicians to participate using a sequential sampling technique until the required sample size was reached. The investigator attended the morning meetings of each of the three centres in Eastern Province for two weeks. This time frame was used to cover the shifts' schedules. The investigator met most of the physicians as the clinic schedules changed every 3 - 4 days. Permission was asked for at the end of the meetings from the chairman to provide an overview of the study and to invite the physicians to participate in the survey. The overview talk took about ten minutes; each physician was provided with an explanatory statement after he/she agreed to take part in the study. Instructions were given on how to fill out the questionnaire without sharing the answers with the other physicians in the audience.

The investigator counted how many questionnaires were distributed every morning and how many were returned. Participants were requested to place the completed survey into the collection box at the entrance of the departments. Physicians were assured that identifiers such as ID or names were not required.

The same process was repeated in the department meeting room after the staff meeting every morning for five days a week during working hours, for two weeks in each centre. Up to two friendly reminders to return the completed questionnaire were given at lunch time on Mondays and Thursdays, one week apart.

V. VALIDATION OF DATA COLLECTION TOOL

1. The study questionnaire was shown to two family physicians who are experts in diabetic care and diabetic research for their feedback and modification (i.e. face and content validity)
2. A pilot study was conducted on 10 physicians. This pilot study was used to test their ability to understand the questions and respond appropriately.

The following variables were collected:

- Socio-demographics: age, gender, title, type of postgraduate education, number of years in clinical practice
- Postgraduate training in lifestyle modification such as a course which follows the American Diabetes Association guidelines
- Attitudes towards lifestyle interventions
- Self-reported practices regarding lifestyle interventions

- Reasons for suboptimal implementation of lifestyle interventions.

VI. DATA ANALYSIS

The questionnaire responses were coded and the data collected were entered into an Excel file. Data were presented as means and standard deviations (SD) for continuous variables (such as age and duration of employment) and frequencies and percentages for categorical variables (such as barriers).

Scores were calculated for both attitudes towards lifestyle interventions and the frequency of referral of patients with T2D to specialized services. For the Likert-scaled attitude questions, strongly agree was given 5 and strongly disagree was given 1. Negative statements in the attitude questions (Questions 9.1, 9.5, 9.7, and 9.8) were scored in the opposite direction.

For the frequency of referral questions, >10 times were given 3 while 0-3 times were given 1. Overall scores were calculated by summing up individual scores of questions, with the maximum possible score of 50 for attitudes towards lifestyle interventions and 15 for the frequency of referrals to specialized services. Higher scores indicated positive attitudes towards lifestyle interventions and more frequent referrals to specialized services. Categorization of the two scores was done using the following definitions: less and more positive attitudes (< median and ≥ median, respectively); and less frequent and more frequent referrals (≤median and > median, respectively). A positive attitude is defined as those who had an attitude score above the median.

The association between attitudes and referrals were examined. Additionally, demographic and occupational characteristics of physicians were compared between the attitude and referral groups (above) using Chi-square or Fisher's exact tests, as appropriate, for categorical data, and the t-test or Mann-Whitney U test, as appropriate, for continuous data.
All P-values were two-tailed. A P-value <0.05 was considered statistically significant. SPSS software (release 23, Armonk, NY: IBM Corp) was used for all statistical analyses.

VII. ETHICAL CONSIDERATIONS

Several measures were undertaken to promote an ethical approach in conducting this study:

- The proposal was approved by the Research Ethics Committee in Medical Services Department for Armed Forces Scientific Research Centre before starting data collection. The proposal was also approved by the Monash University Human Research Ethics Committee (MUHREC).
- Physicians were requested to read the explanatory statement (Appendix) that explained the objectives of the study before filling out the questionnaire.
- Participation was voluntarily and the physicians were assured that the survey was not making any judgements about their clinical competence or correct practice.
- Physicians were advised to have the completed survey placed into a collection box to ensure anonymity and lack of negative consequences.
- Completing the questionnaire was considered to be consent for participation.
- No incentives or rewards were given to the physicians.
- Data collected will be stored in accordance with Monash University regulations and will be kept on University premises, in a locked filing cabinet for 5 years. After that, any written material will be shredded and destroyed. Data transferred to computer files will be kept secured via password controls within the Monash University computer system.
- Data were treated with complete confidentiality and anonymity throughout the study period.
- Data were only used for the purposes described in the study objectives.
- Individual participants will not be identifiable in future publications from the study.

VIII. RESULTS CHARACTERISTICS OF THE PHYSICIANS

One hundred and ninety six out of 220 questionnaires were completed, giving a response rate of 89.1%. Demographic and occupational characteristics of the participating physicians are shown in Table 1. Out of 196 physicians, 115 (58.7%) were male. The age ranged between 30 and 50 years with a mean age of approximately 40 years. The duration of clinical practice ranged between 2 and 10 years, with a mean duration of 7.3years. More than two-thirds (68.9%) of the physicians had their undergraduate medical education in the Middle East outside Saudi Arabia while 26.0% had it in Saudi Arabia. Registrars were the most common (53.1%) professional category among the physicians, followed by consultants (33.7%) and residents (13.3%).
More than two-thirds (68.9%) of the physicians received postgraduate education on ADA guidelines for lifestyle interventions. Among the physicians who received that education (N=135), almost three-quarters (72.6%) had it more than 2 years ago, while one-quarter (27.4%) had it within the last 2 years.

The majority of the physicians reported having good (54.6%) to excellent (30.6%) knowledge about the ADA guidelines for lifestyle interventions. All the respondents were taking care of patients with T2D, with the majority (74.0%) seeing between 10 and 50 diabetic patients per week.

IX. KNOWLEDGE, ATTITUDES AND BELIEFS OF THE PHYSICIANS TO LIFESTYLE INTERVENTIONS

The physicians' responses to questions regarding ADA lifestyle interventions among patients with type 2 diabetes are shown in Table 2. A positive attitude means agreement on the Likert scale. The questions that had the greatest agreement responses included: smoking cessation reduces microvascular complications of diabetes (92.3%), patients with diabetes should all be screened for depression (91.3%), diet is far more effective than drugs in improving glycemic control (89.3%) and changing one's lifestyle in the long term is achievable for most patients (67.3%). The questions that had the lowest agreement responses included: dietary advice is more effective when provided by a dietitian rather than a family physician (17.9%) and changing one's lifestyle in the long term is achievable for most patients (67.3%). As shown in Table 4, the agreement responses to all the ten attitudinal questions ranged between 52.0% and 86.0%, with an average overall agreement of 79.0%. This was equivalent to scores between 26 and 43 (out of a maximum of 50 points), with an average adjusted attitude score of 39.5 points.

Table 1: Attitudes of the study physicians towards ADA lifestyle interventions for patients with type 2 diabetes

	Mean	Standard Deviation	Minimum	Maximum	Median	Interquartile range
Attitude score						
Likert scale scores	38.2	4.2	26	43	39.5	38-41
Frequent referral* score						
Likertscale scores	9.1	0.9	6	11	9	8-10

* Items 9.1, 9.5, 9.7, and 9.8 were negatively worded and/or deliberately incorrect

X. REFERRALS BY THE PHYSICIANS

The frequencies of referrals of patients with type 2 diabetes to other specialized services in the last 6 months are shown in Table 3. We defined a 'frequent referral' as one which has occurred at least 4 times during the last 6 months. On that basis, 94.9% of the patients were frequently referred to dietitians, followed by 90.8% to endocrinologists or diabetologists, 75.0% to diabetes educators, 71.4% to weight loss programs, and 5.6% to bariatric surgeons.

Using a definition of 'frequent referral' as being more than 10 times during the last 6 months, it was found that 63.8% of the patients were frequently referred to dietitians and only few (0.0% to 4.6%) of the patients were referred to other specialized services. As shown in Table 4, frequent referral to all other specialized services combined ranged between 40.0% and 73.0%, with an average referral of 60.0%. This was equivalent to scores between 6 and 11 (out of a maximum of 15 points), with an average referral score of 9 points.

Table 2: Frequency of referral of patients with type 2 diabetes to the specialized services in the last 6 months

	0-3 times	4-10 times	>10 times
Dietitians	10 (5.1%)	61 (31.1%)	125 (63.8%)
Diabetes educators	49 (25.0%)	144 (73.5%)	3 (1.5%)
Weight loss programs	56 (28.6%)	140 (71.4%)	0 (0.0%)
Endocrinologists/diabetologists	18 (9.2%)	169 (86.2%)	9 (4.6%)
Bariatric surgeons	185 (94.4%)	11 (5.6%)	0 (0.0%)

Table 3: Overall scores of physician attitudes towards ADA lifestyle interventions and the frequency of their referral practice among patients with type 2 diabetes

* For at least 4 times during the last 6 months

XI. BARRIERS TO LIFESTYLE INTERVENTION

We distinguished between the 'initiation' and the 'effectiveness' of lifestyle counseling by physicians of T2D patients. The former refers to the physician's first attempt at trying to get a patient to change their lifestyle; the latter describes the follow up, feedback, review and maintenance of lifestyle counselling in subsequent consultations.

As shown in Figure 1, the majority (>90%) of the physicians reported the following items as barriers to the initiation of lifestyle counseling among their patients: busy doctor's schedule (97.4%), non-cooperative patients (97.4%), lack of resources such as materials to take away (96.9%), lack of

multidisciplinary team communication (94.9%), poor patient adherence with scheduled visits (93.9%), and lack of referral pathways (93.4%).

As shown in Figure 2, the majority (>90%) of the physicians reported the following items as barriers for the subsequent effectiveness of lifestyle counseling once this had been initiated among their patients: poor patient adherence with scheduled visits (99.0%), lack of easily accessible guidelines in the clinic on lifestyle counseling (96.9%), lack of multidisciplinary team communication (96.9%), lack of physician training on lifestyle assessment and counseling (96.4%), poorly designed diabetic health records (96.4%), and lack of referral pathways (94.9%). Barriers reported for both the initiation and effectiveness of lifestyle counseling included: poor patient adherence with scheduled visits, lack of multidisciplinary team communication, and lack of referral pathways.

FIGURE 1: Barriers for the initiation of lifestyle counseling for T2D patients

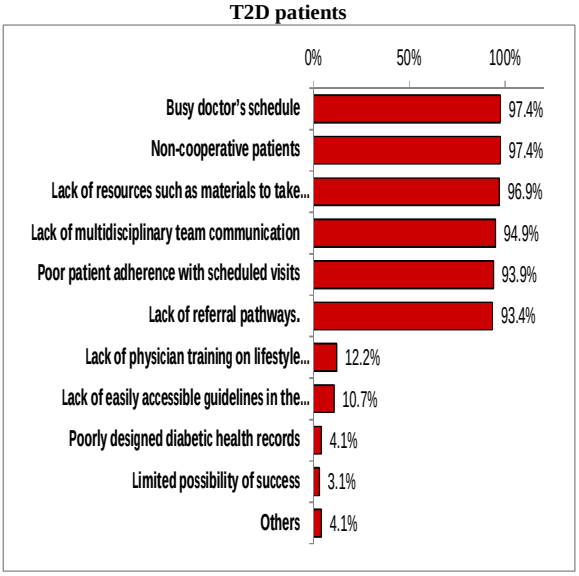
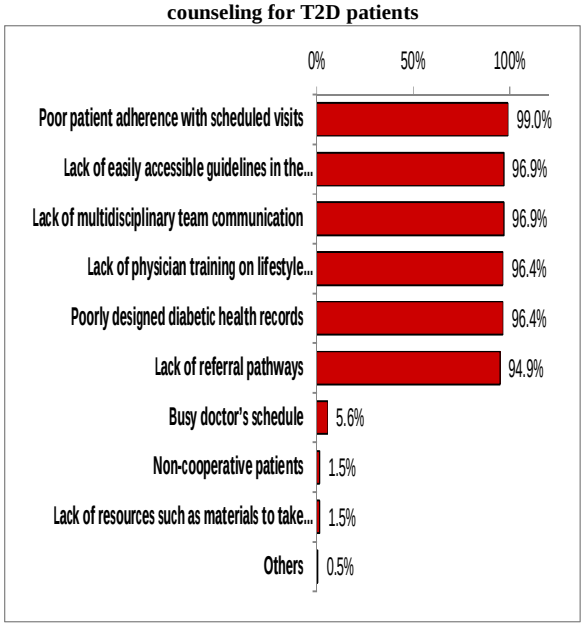


FIGURE 2: Barriers for effectiveness of initiated lifestyle counseling for T2D patients



XII. ASSOCIATIONS WITH POSITIVE ATTITUDES TO LIFESTYLE INTERVENTIONS

The associations between demographic and occupational characteristics with positive attitudes towards ADA lifestyle interventions and frequent referral practices in the last 6 months are shown in Tables 5 and 6 respectively. A positive attitude was significantly associated with a higher rank of professional category ($p<0.001$) and higher self-rating of knowledge ($p<0.001$), and showed a trend toward a significant association with the lower number of T2D patients seen per week ($p=0.073$).

For example, while a positive attitude was lacking among the few residents included, it was significantly above the average (50%) among consultants (57.6%) and registrars (57.7%). Similarly, while a positive attitude was lacking among the few physicians who had low self-rating of knowledge (unaware or fair knowledge), it was significantly above the average among those who had their self-rating of knowledge as good (56.1%) or excellent (63.3%).

Additionally, a positive attitude was inversely proportional to the number of T2D patients seen per week, being 59.1% among those who see <10 patients per week and 31.0% among those who see >50 patients per week. However, this observation was only marginally significant ($p=0.073$). On the other hand, there were no significant associations ($p>0.05$) between positive attitudes and other demographic and occupational characteristics of the study physicians such as age, gender, duration of clinical practice, location of undergraduate medical education, and receiving postgraduate education. Unlike positive attitudes, frequent referral practices were not associated with any demographic and occupational characteristics of the study physicians (Table 6).

The associations between positive attitudes towards ADA lifestyle interventions and frequent referral practices in the last 6 months are shown in Figures 3 and 4. Defining frequent referral practice as either ≥4 times or occasionally >10 times within last 6 months, a positive attitude was significantly associated with frequent referral of their own patients to weight loss programs ($p=0.004$). On the other hand, defining frequent referral practice as >10 times within the last 6 months, a less positive (i.e. negative) attitude was significantly associated with frequent referral of their own patients to endocrinologists or diabetologists ($p=0.007$). This observation disappeared when defining frequent referral practices as ≥4 times within the last 6 months ($p=0.621$).

FIGURE 3: Frequency of high referral practice (≥4 times within last 6 months) by the groups (of the score) of attitude towards ADA lifestyle interventions

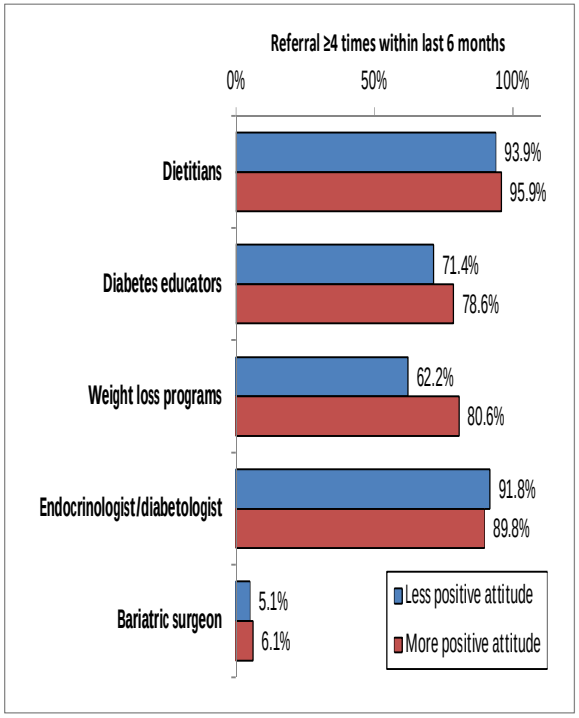
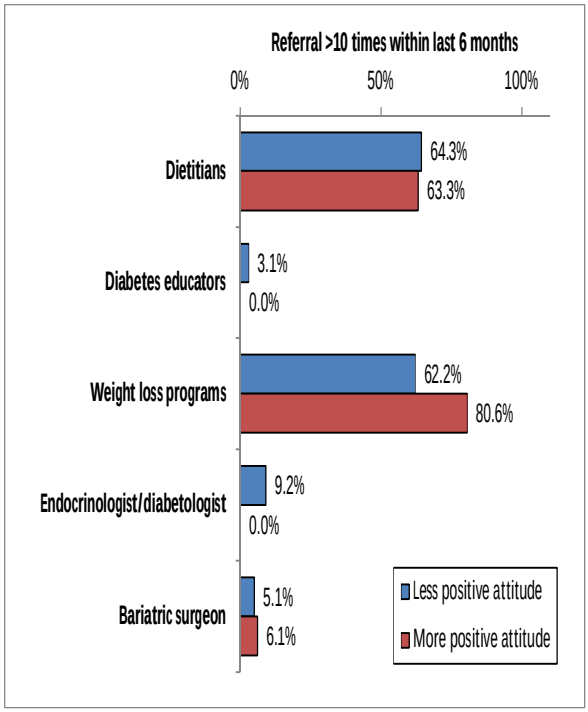


FIGURE 4: Frequency of high referral practice (>10 times within last 6 months) by the groups (of the score) of attitude towards ADA lifestyle interventions



DISCUSSION

The key finding of the current study was that there was generally agreement about lifestyle interventions among a sample of family physicians caring for patients with T2D in primary care centers in the Eastern Province of Saudi Arabia.

Using responses to the 10 questions assessing the attitude towards lifestyle interventions, family physicians in the current study reported close to 80% overall positive attitudes (i.e. agreement).

The current finding was generally consistent with the majority of previous studies that have shown positive attitudes towards lifestyle interventions among family physicians in different countries [29, 30, 33]. For example, a study has shown that 98% of Finnish family physicians recognized that their task is to motivate and support their diabetic patients to positively change their lifestyles and 79% of the doctors believed that their task is to make sure their patients follow the given lifestyle instructions [30]. Additionally, close to 90% of family physicians in Canada and Indonesia would advise their diabetic patients to reduce fat and carbohydrate consumption and to regularly practice moderate physical activity [29, 33].

On the other hand, studies assessing the attitude of family physicians in Saudi Arabia showed mixed findings [32]. For example, while almost all physicians were aware of the importance of lifestyle interventions as a first step in the treatment of patients with T2D, only 13% were aware of the importance of diabetes self-management education and no more than 65% agree that a newly diagnosed patient with diabetes should be referred to a diabetologist [32].

The current study showed a significant association between positive attitudes towards lifestyle interventions and better physician knowledge and experience as indicated by higher self-rating of knowledge and higher rank of professional category. Similarly, in the Saudi study assessing attitudes of family physicians towards diabetic care, availability of clinical practice guidelines was associated with better adherence with ADA standards for diabetic care, including lifestyle interventions [32]. Additionally, it has been shown in Israel that board certified family physicians and their residents found it less difficult to change the lifestyle habits of their patients compared with non-board certified family physicians [24].

Unlike the generally positive attitude towards lifestyle interventions, family physicians in the current study showed much less adherence with referrals to other specialties. For example, while the majority of the physicians reported seeing 10-50 patients with T2D per week, less than two-thirds of the physicians referred their patients to dietitians more than 10 times during the last 6 months and less than 5% referred their patients to other specialized services. This low referral practice may indicate a negative belief about the importance of referral as well as the presence of other barriers. For example, less than 20% of the physicians in the current study believed that dietary advice is more effective when provided by a dietitian rather than a family physician.

Additionally, lack of referral pathways and lack of multidisciplinary team communications were well-

recognized barriers in the current study for both the initiation and effectiveness of lifestyle interventions. In the only identified Saudi study examining the attitude of family physicians towards diabetes management, there was a lack of information regarding referral practices [32].

Ideally, the individual with diabetes should be referred to a registered dietitian after diagnosis and for ongoing follow-up. Unfortunately, a large percentage of people with diabetes do not receive any structured diabetes education and/or nutrition therapy.About half of the people with diabetes report receiving some type of diabetes education and even fewer see a registered dietitian [40].

Indeed, adherence to recommended referrals as a component of diabetes management in Saudi Arabia has been shown to be inadequate using guidelines as the yardstick [21]. For example, an audit study at a primary care centre in Saudi Arabia showed that the referral of diabetic patients to the eye clinic was much lower than the national target [21]. Despite the importance and effectiveness of referrals in the management of diabetes [41, 42], there is a substantial reluctance for referral of patients with diabetes to nutritionists or dietitians, fitness specialists [33], or other diabetes specialists [24]. Similarly, the referral practices among patients with diabetes in the US and Canada have been shown to be inadequate or delayed [42, 43]. Interestingly, referrals to dieticians in the current and previous studies have been shown to be more frequent than referrals to other specialties related to diabetes management and lifestyle interventions among patients with diabetes [24, 41, 43].

As expected, the current findings showed a positive association between positive attitudes of the family physicians towards lifestyle interventions and the frequency of referral to weight loss programs. Consistent with this finding, the frequency and quality of assessment, education, follow up, and referral concerning lifestyle interventions among primary care patients have been shown to be influenced by physicians' perception of the effectiveness of the advice [27] as well as physician knowledge and skills in lifestyle intervention in diabetes management [25, 32].

Some studies have reported that positive attitudes towards lifestyle interventions do not always translate into adherence with these interventions [29, 30]. In our study the negative association between attitudes towards lifestyle interventions and frequent referral to endocrinologists or diabetologists is difficult to explain. However, it was derived from few observations and may have shown a reluctance to manage diabetic patients in general and not only lifestyle interventions.

The findings of the previous studies regarding the impact of physician demographic characteristics on counseling and referral practices were conflicting [29, 32]. For example, some studies failed to detect any considerable impact of demographic or occupational characteristics of the physician on diabetic management [29] while others reported associations with gender, nationality, and working area [32]. However, none of these studies were specifically focusing on lifestyle interventions but rather diabetic management in general.

The reported barriers to the initiation and effectiveness of lifestyle counseling in the current study were not surprising. For example, in addition to the referral-related barriers discussed above, busy doctor’s schedule, non-cooperative patients, and poor patient adherence with scheduled visits were well-recognized barriers recognised by the majority of physicians in the current study. Similarly, a lack of patient motivation or unwillingness to change, time pressure, and system problems with referrals have been reported in a number of studies as barriers to adherence with ADA standards for lifestyle interventions [30, 33, 39].

CONCLUSIONS

We have reported a generally positive attitude towards lifestyle interventions but relatively less frequent referral rates than recommended in ADA guidelines among a sample of family physicians caring for patients with T2D in Saudi Arabia. Significant associations have been detected between positive attitudes towards lifestyle interventions and better physician knowledge and experience as well as the frequency of referrals to weight loss programs. Several system barriers (referral pathway, multidisciplinary approach, time pressure, resources, records, guidelines) and to a lesser extent patient barriers (poor cooperation and poor adherence) have been reported to limit the initiation and effectiveness of lifestyle counseling.

The current findings can be potentially helpful in identifying the steps required for a local improvement initiative to promote lifestyle counseling and referral practices.

REFERENCES

[1] 1. World Health Organization: Global report on diabetes. Geneva, 2016. URL: http://www.who.int/diabetes/global-report/en/. 2016.

[2] 2. Al-Nozha MM, Al-Maatouq MA, Al-Mazrou YY, Al-Harthi SS, Arafah MR, Khalil MZ, Khan NB, Al-Khadra A, Al-Marzouki K, Nouh MS et al: Diabetes mellitus in Saudi Arabia. Saudi medical journal 2004, 25(11):1603-1610.

[3] 3. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE: Global estimates of diabetes prevalence for 2013 and projections for 2035. Diabetes research and clinical practice 2014, 103(2):137-149.

[4] 4. International Diabetes Federation: Diabetes Atlas, sixth Edition. URL: https://www.idf.org/sites/default/files/EN_6E_Atlas_Full_0.pdf (Last accessed November 1, 2015). 2013.
[5] 5. Al-Aboudi IS, Hassali MA, Shafie AA, Hassan A, Alrasheedy AA: A cross-sectional assessment of health-related quality of life among type 2 diabetes patients in Riyadh, Saudi Arabia. SAGE Open Med 2015, 3:2050312115610129.
[6] 6. Alhowaish AK: Economic costs of diabetes in Saudi Arabia. Journal of family & community medicine 2013, 20(1):1-7.
[7] 7. Midhet FM, Al-Mohaimeed AA, Sharaf FK: Lifestyle related risk factors of type 2 diabetes mellitus in Saudi Arabia. Saudi medical journal 2010, 31(7):768-774.
[8] 8. Al-Daghri NM, Al-Attas OS, Alokail MS, Alkharfy KM, Yousef M, Sabico SL, Chrousos GP: Diabetes mellitus type 2 and other chronic non-communicable diseases in the central region, Saudi Arabia (Riyadh cohort 2): a decade of an epidemic. BMC medicine 2011, 9:76.
[9] 9. Al-Quwaidhi AJ, Pearce MS, Sobngwi E, Critchley JA, O'Flaherty M: Comparison of type 2 diabetes prevalence estimates in Saudi Arabia from a validated Markov model against the International Diabetes Federation and other modelling studies. Diabetes research and clinical practice 2014.
[10] 10. Alfadda A, Abdulrahman KA: Assessment of care for type 2 diabetic patients at the primary care clinics of a referral hospital. Journal of family & community medicine 2006, 13(1):13-18.
[11] 11. Al Harbi TJ, Tourkmani AM, Al-Khashan HI, Mishriky AM, Al Qahtani H, Bakhiet A: Adherence to the American Diabetes Association standards of care among patients with type 2 diabetes in primary care in Saudi Arabia. Saudi medical journal 2015, 36(2):221-227.
[12] 12. Al-Yousuf M, Akerele TM, Al-Mazrou YY: Organization of the Saudi health system. East Mediterr Health J 2002, 8(4-5):645-653.
[13] 13. Almalki M, Fitzgerald G, Clark M: Health care system in Saudi Arabia: an overview. East Mediterr Health J 2011, 17(10):784-793.
[14] 14. Saudi Ministry of Health: Health statistical year book. Riyadh, Saudi Arabia, 2015. 2015.
[15] 15. Al-Ahmadi H, Roland M: Quality of primary health care in Saudi Arabia: a comprehensive review. Int J Qual Health Care 2005, 17(4):331-346.
[16] 16. Almutairi KM: Quality of Diabetes Management in Saudi Arabia: A Review of Existing Barriers. Archives of Iranian medicine 2015, 18(12):816-821.
[17] 17. Al-Elq AH: Current practice in the management of patients with type 2 diabetes mellitus in Saudi Arabia. Saudi medical journal 2009, 30(12):1551-1556.
[18] 18. Al Johani KA, Kendall GE, Snider PD: Self-management practices among type 2 diabetes patients attending primary health-care centres in Medina, Saudi Arabia. East Mediterr Health J 2015, 21(9):621-628.
[19] 19. Al-Khaldi YM, Al-Sharif AI: Availability of resources of diabetic care in primary health care settings in Aseer region, Saudi Arabia. Saudi medical journal 2002, 23(12):1509-1513.
[20] 20. Al-Khaldi YM, Khan MY: Audit of a diabetic health education program at a large Primary Health Care Centre in Asir region. Saudi medical journal 2000, 21(9):838-842.
[21] 21. Al-Khaldi YM, Khan MY, Khairallah SH: Audit of referral of diabetic patients. Saudi medical journal 2002, 23(2):177-181.
[22] 22. American Diabetes Association: Standards of Medical Care in Diabetes-2016. Diabetes Care 2016, 39 Suppl 1:S1-106.
[23] 23. Harris SB, Petrella RJ, Leadbetter W: Lifestyle interventions for type 2 diabetes. Relevance for clinical practice. Can Fam Physician 2003, 49:1618-1625.
[24] 24. Fogelman Y, Goldfracht M, Karkabi K: Managing Diabetes Mellitus: A Survey of Attitudes and Practices Among Family Physicians. J Community Health 2015, 40(5):1002-1007.
[25] 25. Murray S, Lazure P, Schroter S, Leuschner PJ, Posel P, Kellner T, Jenkins RD: International challenges without borders: a descriptive study of family physicians' educational needs in the field of diabetes. BMC Fam Pract 2011, 12:27.
[26] 26. Ferrante JM, Piasecki AK, Ohman-Strickland PA, Crabtree BF: Family physicians' practices and attitudes regarding care of extremely obese patients. Obesity (Silver Spring) 2009, 17(9):1710-1716.
[27] 27. Ampt AJ, Amoroso C, Harris MF, McKenzie SH, Rose VK, Taggart JR: Attitudes, norms and controls influencing lifestyle risk factor management in general practice. BMC Fam Pract 2009, 10:59.
[28] 28. Stead M, Angus K, Holme I, Cohen D, Tait G: Factors influencing European GPs' engagement in smoking cessation: a multi-country literature review. Br J Gen Pract 2009, 59(566):682-690.
[29] 29. Widyahening IS, van der Graaf Y, Soewondo P, Glasziou P, van der Heijden GJ: Awareness, agreement, adoption and adherence to type 2 diabetes mellitus guidelines: a survey of Indonesian primary care physicians. BMC Fam Pract 2014, 15:72.
[30] 30. Jallinoja P, Absetz P, Kuronen R, Nissinen A, Talja M, Uutela A, Patja K: The dilemma of patient responsibility for lifestyle change: perceptions among primary care physicians and nurses. Scand J Prim Health Care 2007, 25(4):244-249.
[31] 31. Brown JB, Harris SB, Webster-Bogaert S, Wetmore S, Faulds C, Stewart M: The role of patient, physician and systemic factors in the management of type 2 diabetes mellitus. Family Practice 2002, 19(4):344-349.
[32] 32. Khan AR, Al Abdul Lateef ZN, Khamseen MB, Al Aithan MA, Khan SA, Al Ibrahim I: Knowledge, attitude and practice of ministry of health primary health care physicians in the management of type 2 diabetes mellitus: a cross-sectional study in the Al Hasa District of Saudi Arabia, 2010. Nigerian journal of clinical practice 2011, 14(1):52-59.
[33] 33. Harris SB, Petrella RJ, Lambert-Lanning A, Leadbetter W, Cranston L: Lifestyle management for type 2 diabetes. Are family physicians ready and willing? Can Fam Physician 2004, 50:1235-1243.
[34] 34. Bovier PA, Sebo P, Abetel G, George F, Stalder H: Adherence to recommended standards of diabetes care by Swiss primary care physicians. Swiss Med Wkly 2007, 137(11-12):173-181.
[35] 35. McAvoy BR, Kaner EF, Lock CA, Heather N, Gilvarry E: Our Healthier Nation: are general practitioners willing and able to deliver? A survey of attitudes to and involvement in health promotion and lifestyle counselling. Br J Gen Pract 1999, 49(440):187-190.
[36] 36. Greenhalgh T: Barriers to concordance with antidiabetic drugs--cultural differences or human nature? BMJ 2005, 330(7502):1250.
[37] 37. Chin MH, Cook S, Jin L, Drum ML, Harrison JF, Koppert J, Thiel F, Harrand AG, Schaefer CT, Takashima HT et al: Barriers to providing diabetes care in community health centres. Diabetes Care 2001, 24(2):268-274.
[38] 38. Elliott DJ, Robinson EJ, Sanford M, Herrman JW, Riesenberg LA: Systemic barriers to diabetes management in primary care: a qualitative analysis of Delaware physicians. Am J Med Qual 2011, 26(4):284-290.
[39] 39. Vermunt PW, Milder IE, Wielaard F, Baan CA, Schelfhout JD, Westert GP, van Oers HA: Implementation of a lifestyle intervention for type 2 diabetes prevention in Dutch primary care: opportunities for intervention delivery. BMC Fam Pract 2012, 13:79.
[40] 40. Evert AB, Boucher JL, Cypress M, Dunbar SA, Franz MJ, Mayer-Davis EJ, Neumiller JJ, Nwankwo R, Verdi CL, Urbanski P et al: Nutrition Therapy Recommendations for the Management of Adults With Diabetes. Diabetes Care 2013, 36(11):3821-3842.
[41] 41. Morgan CL, Currie CJ, Hunt J, Evans JD, Rogers C, Stott NC, Peters JR: Relative activity and referral patterns for diabetes and non-diabetes in general practice. Diabet Med 2000, 17(3):230-235.

[42] 42. Bajaj HS, Aronson R, Venn K, Ye C, Sharaan ME: The Need Associated with Diabetes Primary Care and the Impact of Referral to a Specialist-Centreed Multidisciplinary Diabetes Program (the NADIR Study). Can J Diabetes 2016, 40(2):120-125.

[43] 43. Peek ME, Tang H, Alexander GC, Chin MH: National prevalence of lifestyle counseling or referral among African-Americans and whites with diabetes. J Gen Intern Med 2008, 23(11):1858-1864.

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