


# BMJ Open Nutrition competence of primary care physicians in Saudi Arabia: a cross-sectional study

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**To cite:** Al-gassimi O, Shah HBU, Sendi R, *et al*. Nutrition competence of primary care physicians in Saudi Arabia: a cross-sectional study. *BMJ Open* 2020;**10**:e033443. doi:10.1136/bmjopen-2019-033443

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-033443>).

Received 05 August 2019  
Revised 13 November 2019  
Accepted 18 November 2019



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## ABSTRACT

**Objectives** Primary care physicians have an opportunity to support healthy dietary behaviours of patients by providing nutrition care. However, it is unclear whether primary care physicians in the Kingdom of Saudi Arabia (KSA) are sufficiently competent in nutrition. This study aimed to assess the nutrition competence of primary care physicians in KSA and identify whether nutrition competence is associated with the provision of nutrition care to patients living with diet-related chronic disease.

**Design** A cross-sectional study.

**Setting** Chronic disease clinics across 48 primary care centres under the Ministry of Health in the city of Jeddah, KSA.

**Participants** 90 primary care physicians completed the survey (response rate: 98%). General practitioners and family medicine residents, specialists, and consultants actively working in chronic disease clinics between February and May 2019 were included.

**Primary and secondary outcome measures** Primary outcome measure was nutrition competence of primary care physicians measured via the validated nutrition competence (NUTCOMP) questionnaire.

**Results** Primary care physicians perceived themselves as competent in nutrition care but their reported provision of nutrition care was limited. Confidence in their nutrition knowledge and skills elicited the lowest mean scores of 25.8 ( $\pm 5.4$ ) out of 35 and 29 ( $\pm 5.2$ ) out of 40, respectively. The reported provision of nutrition care was closely correlated with physicians' confidence in their nutrition knowledge ( $r=0.57$ ) and communication ( $r=0.52$ ). Three factors were identified as predicting whether physicians provide nutrition care to patients: confidence in counselling about nutrition ( $p<0.001$ ), having previous nutrition education ( $p=0.005$ ) and a higher professional qualification ( $p=0.008$ ).

**Conclusions** Primary care physicians felt confident in providing nutrition care to patients living with diet-related chronic disease. Primary care physicians would benefit from higher levels of nutrition knowledge and skills to effectively support patients to improve their dietary behaviours and health conditions, leading to a positive impact on public health.

## INTRODUCTION

The burden of diet-related diseases is continuing to rise globally.<sup>1</sup> Dietary risks were

## Strengths and limitations of this study

- This study is the first of its kind in Saudi Arabia to estimate the nutrition competence of primary care physicians.
- The validated nutrition competence tool and high response rate (98%).
- Representativeness of study sample (the sample did not differ significantly from primary care physicians across the country regarding age and gender).
- The self-reported design of the tool means that physicians may have reported socially acceptable answers.
- Physicians' dietary habits were not investigated, which could be related to their provision of nutrition care.

responsible for 22% of all deaths and 15% of all disability-adjusted life years (DALYs) among adults globally in 2017.<sup>1</sup> Cardiovascular diseases and type 2 diabetes were among the leading causes of death and DALYs globally.<sup>1</sup> In the Kingdom of Saudi Arabia (KSA), poor diet accounted for 25.6% of all deaths and 17.4% of all DALYs among adults in 2017.<sup>2</sup> Raised blood pressure affects 15.2% of the population and 40.5% are borderline hypertensive.<sup>3</sup> Type 2 diabetes affects 13.2% of the population and 16.3% have pre-diabetes.<sup>3</sup> Moreover, the prevalence of obesity has been increasing for the last four decades reaching to 28.7% of the population.<sup>3</sup> Improving dietary behaviours at a population level must be a priority for KSA's healthcare system.

Nutrition care refers to any practice conducted by a health professional that supports patients to improve their dietary behaviours and subsequent biomarkers of disease.<sup>4</sup> These practices may include nutrition assessment, nutrition advice and nutrition counselling within routine consultations.<sup>4</sup> Nutrition care provided by primary care physicians has been shown to improve patients' dietary behaviours in

**Table 1** Demographic characteristics of physicians (n=90)

Demographics	n	%
<b>Professional qualification</b>		
GP	33	37.7
FM resident	26	28.9
FM specialist	19	21.1
FM consultant	12	13.3
<b>Gender</b>		
Male	33	36.7
Female	57	63.3
<b>Age (years)</b>		
25 or younger	3	3.3
26–34	36	40.0
35–44	33	36.7
45–54	15	16.7
55 or older	3	3.3
<b>Previous nutrition education</b>		
Completed a programme that did not contain any nutrition content	15	16.7
Completed a programme that contained some nutrition content	64	71.1
Completed a programme that was predominantly focused on nutrition	11	12.2
<b>Previous engagement in continuing education in nutrition</b>		
Yes	32	35.6
No	58	64.4
<b>Need for further nutrition education</b>		
Strongly disagree	4	4.4
Disagree	4	4.4
Neither agree nor disagree	9	10.0
Agree	34	37.8
Strongly agree	39	43.3
<b>Frequency of providing nutrition care to patients over a given month</b>		
Never (0%)	9	10.0
Rarely (1%–20%)	22	24.4
Half the time (41%–60%)	33	36.7
Often (61%–80%)	16	17.8
Most of the time (81%–100%)	10	11.1
<b>Average time spent on providing nutrition care during a routine visit</b>		
Less than 1 min	11	12.2
1 to less than 3 min	42	46.7
3 to less than 5 min	23	25.6
5 to less than 10 min	14	15.6
10 min or over	0	0.0

FM, family medicine; GP, general practitioner.

other countries.<sup>5</sup> Furthermore, patients perceive nutrition information from primary care physicians as credible and reliable,<sup>6</sup> even more than nutrition advice from dietitians.<sup>7</sup> Most primary care physicians acknowledge they have an important role in providing nutrition care to patients and perceive nutrition care as an important aspect of their practice,<sup>8,9</sup> especially when patients are at risk based on their dietary habits and body mass index.<sup>10</sup> Therefore, the primary care workforce of KSA has a clear opportunity to support the Saudi population to have healthy dietary behaviours.

Competence refers to the set of knowledge, skills, communication and attitudes that facilitate a clinician's ability to perform safe and effective healthcare practices.<sup>11</sup> There are long-standing concerns that primary care physicians are not competent in providing nutrition care to patients<sup>12–14</sup>; however, it is unknown whether this extends to KSA. Better understanding the nutrition competence of primary care physicians in KSA will enable future strategies to be developed to support this workforce in their role. This study aimed to assess the nutrition competence of primary care physicians in KSA and to identify whether nutrition competence is associated with the provision of nutrition care to patients living with diet-related chronic disease.

## METHODS

This study used a cross-sectional design. Ethical approvals were granted by the Saudi Board of Preventive Medicine Research Committee and the Ethics Committee of Health Directorate in Jeddah (H-02-J-002-01023).

### Participants and recruitment

Patients in KSA living with a chronic disease are recommended to receive nutrition care in primary care centres.<sup>15</sup> Since the Ministry of Health (MOH) in KSA is the major provider of primary care to the general population,<sup>16</sup> target population was physicians allocated to chronic disease clinics across all 48 primary care centres under MOH in Jeddah, KSA. Potential participants were general practitioners (GPs) and family medicine (FM) residents, specialists and consultants actively working in those clinics between February and May 2019.

An anonymous, self-administered paper-based survey was distributed to all 92 physicians in the potential participant pool. The survey included an information sheet for participants, and they were given the option to return an empty or filled out survey. To reduce social desirability bias, participants filled in the survey by themselves, without supervision. Informed consent was inferred by each participant's return of a completed survey.

### Survey instrument

This study used the validated nutrition competence (NUTCOMP) tool<sup>17</sup> in an identical manner. The wording of two items (section 1, item 4 and section 2, item 4) was slightly amended from 'Australian Guide

**Table 2** Nutrition competence mean scores of all physicians and their subgroups

Nutrition competence construct	Physicians' professional qualification	n	Mean	Median	SD	P value
Knowledge (maximum=35)	GP	33	23.8	22	5.9	0.003*
	FM resident	26	24.7	26	5.5	
	FM specialist	19	29.3	30	2.6	
	FM consultant	12	28.0	30	3.6	
	<b>All physicians</b>	<b>90</b>	<b>25.8</b>	<b>26</b>	<b>5.4</b>	
Skills (maximum=40)	GP	33	27.8	28	5.3	0.089†
	FM resident	26	30.9	30	5.5	
	FM specialist	19	30.6	32	5.4	
	FM consultant	12	28.9	30	2.0	
	<b>All physicians</b>	<b>90</b>	<b>29.5</b>	<b>29</b>	<b>5.2</b>	
Communication (maximum=45)	GP	33	34.5	35	6.0	0.523*
	FM resident	26	34.8	32	5.2	
	FM specialist	19	35.6	39	5.6	
	FM consultant	12	37.4	38	6.1	
	<b>All physicians</b>	<b>90</b>	<b>35.2</b>	<b>35</b>	<b>5.7</b>	
Attitudes (maximum=40)	GP	33	36.7	39	4.0	0.609*
	FM resident	26	37.4	37.5	2.3	
	FM specialist	19	35.7	37	4.1	
	FM consultant	12	35.9	38	5.5	
	<b>All physicians</b>	<b>90</b>	<b>36.6</b>	<b>38</b>	<b>3.9</b>	

\*Kruskal-Wallis test.

†One-way ANOVA.

ANOVA, analysis of variance; FM, family medicine; GP, general practitioner.

to Healthy Eating' to 'Dietary Guidelines for Saudis'. This tool measures the self-perceived competence of primary health professionals in providing nutrition care to patients with chronic disease.<sup>17</sup> Self-perceived competence in the ability to complete a task has been shown to be an indicator of actual competence when the domains of investigation are specified.<sup>18</sup> Constructs of physicians' self-perceived competence in nutrition were the following: (1) self-perceived knowledge about nutrition, (2) skills in providing nutrition care, (3) communication and counselling about nutrition and (4) attitudes that are conducive toward providing nutrition care.<sup>11 18</sup> Those constructs formed the first four sections of the survey and used 5-point Likert scale questions to rate confidence in all items relevant for each construct. The fifth section asked about any nutrition education or training the respondent had previously undertaken. A section was added that collected information about how often the respondent provided nutrition care to patients and how much time they felt was spent per visit providing nutrition care to patients. The final section of the survey asked for information about the demographic characteristics of respondents. The survey is available as an online supplementary material.

### Pilot

A pilot study was conducted among 10 primary care physicians not working for MOH and their results were not included in the final analysis.

### Patient and public involvement

The previously mentioned pilot was the only stage of the study in which the public was partly involved. The public comprised 10 primary care physicians working for Ministry of Defense (different entity from MOH). They were surveyed by the principal investigator and asked for feedback comments after completing the survey. The essence of surveying those physicians was to assess comprehensibility of the questionnaire. Methodological aspects and outcome measures were not discussed with them.

### Data analysis

Data were analysed using SPSS V.25 (IBM, Armonk, New York, USA). Representativeness of study sample was established by comparing physicians from this survey to the 2017 national statistics book,<sup>16</sup> which mentioned the demographic characteristics of primary care physicians in KSA. For each of the nutrition competence constructs, mean scores were calculated by adding up the scores assigned to

**Table 3** Positive associations between physicians' nutrition competence scores and their demographic characteristics

Construct	Scores % (SD)	Positive associations with physicians' demographic characteristics
Knowledge	73.68 (15.41)	Age (45 years or older, $\chi^2=27.19$ , $p=0.001$ )
		Gender (not significant, $p>0.05$ )
		Professional qualification ( $\chi^2=26.97$ , $p<0.001$ )
		Previous nutrition education ( $\chi^2=14.61$ , $p=0.006$ )
		Engagement in continuing education in nutrition ( $\chi^2=15.19$ , $p=0.001$ )
Skills	73.63 (12.99)	Age ( $\chi^2=30.85$ , $p<0.001$ )
		Gender (female, $\chi^2=13.36$ , $p=0.001$ )
		Professional qualification ( $\chi^2=20.31$ , $p=0.002$ )
		Previous nutrition education ( $\chi^2=9.81$ , $p=0.044$ )
		Engagement in continuing education in nutrition ( $\chi^2=10.17$ , $p=0.006$ )
Communication	78.27 (12.64)	Age ( $\chi^2=44.01$ , $p<0.001$ )
		Gender (not significant, $p>0.05$ )
		Professional qualification (not significant, $p>0.05$ )
		Previous nutrition education (not significant, $p>0.05$ )
		Engagement in continuing education in nutrition (not significant, $p>0.05$ )
Attitudes	91.4 (9.65)	Age (not significant, $p>0.05$ )
		Gender (not significant, $p>0.05$ )
		Professional qualification (not significant, $p>0.05$ )
		Previous nutrition education (not significant, $p>0.05$ )
		Engagement in continuing education in nutrition (not significant, $p>0.05$ )

each answer (not at all confident=1, not very confident=2, somewhat confident=3, very confident=4 and extremely confident=5). Likewise, attitude scores were calculated (completely disagree=1; somewhat disagree=2; neither agree nor disagree=3; somewhat agree=4 and completely agree=5). Physicians were stratified according to their professional qualification into four groups (GP, FM resident, FM specialist, FM consultant). After testing the data for normality, the only normally distributed construct was nutrition skills. Accordingly, Kruskal-Wallis test and analysis of variance with post hoc were used to identify differences in nutrition competence mean scores. Each score was then converted to a percentage and  $\chi^2$  test was used to investigate the associations between nutrition competence constructs and physicians' demographic characteristics. The statistical significance level was set at  $p<0.05$ .

Spearman's and Pearson's correlations were used to identify associations between physicians' nutrition competence and their provision of nutrition care. Linear

**Table 4** Associations between physicians' nutrition competence and their provision of nutrition care

Variables	R	P-value
Knowledge—provision of nutrition care	0.57	$<0.001^*$
Skills—provision of nutrition care	0.27	0.009†
Communication—provision of nutrition care	0.52	$<0.001^*$
Attitudes—provision of nutrition care	0.32	0.002*

\*Spearman's correlation.

†Pearson's correlation.

regression analysis was used to identify predictor variables for physicians' nutrition care practice.

## RESULTS

A total of 90 physicians completed the survey, resulting in a response rate of 98%. The majority of physicians were GPs (38%) and FM residents (29%) and most were female (63%), aged between 26 and 44 years (77%). The sample was representative of primary care physicians in KSA for age and gender ( $p>0.05$ ).

While most physicians ( $n=64$ , 71%) reported completing an education programme that contained some nutrition content, the majority of them ( $n=73$ , 81%) still expressed a need for further nutrition education and training. Only a third of physicians ( $n=32$ , 36%) reported participating in continuing education on the topic of nutrition. Alarmingly, a third of physicians ( $n=31$ , 34%) reported 'never' or 'rarely' counselling their patients about nutrition during the past month, while another third ( $n=33$ , 37%) reported only counselling about nutrition 'half of the time'. The time spent providing nutrition care was less than 3 min per consultation for half of the cohort (59%,  $n=53$ ). **Table 1** describes the demographic characteristics of physicians.

Among the four constructs of nutrition competence, the lowest mean scores were in physicians' self-perceived nutrition knowledge (25.8 ( $\pm 5.4$ )) out of a maximum of 35 and nutrition skills (29 ( $\pm 5.2$ )) out of a maximum of 40. When stratified by physicians' professional qualification, the only significant difference between the subgroups was in physicians' confidence in their nutrition knowledge, as GPs had the lowest knowledge scores (23.8 ( $\pm 5.9$ )) while FM specialists had the highest scores (29.3 ( $\pm 2.6$ )). **Table 2** displays nutrition competence mean scores of all physicians and subgroups according to physicians' professional qualification.

Older physicians (45 years or older) were significantly more likely to report greater confidence in their nutrition knowledge ( $p=0.001$ ), nutrition skills ( $p<0.001$ ) and counselling their patients about nutrition ( $p<0.001$ ) than those aged less than 45 years. More than half ( $n=31$ , 54%) of female physicians reported high levels of confidence in their nutrition skills (extremely confident) as compared

with 18% (n=6) of male physicians. FM specialists had greater confidence in their nutrition knowledge (n=14, 74% were extremely confident) than FM consultants (n=8, 67% were extremely confident).

Physicians who had completed a programme that predominantly focused on nutrition were significantly more likely to report higher confidence in their nutrition knowledge ( $\chi^2=14.61$ ,  $p=0.006$ ) and nutrition skills ( $\chi^2=9.81$ ,  $p=0.044$ ) than those who had completed a programme that contained some nutrition content or did not contain nutrition content at all. Similarly, those who were engaged in continuing education on the topic of nutrition were significantly more likely to report higher confidence in their nutrition knowledge ( $\chi^2=15.19$ ,  $p=0.001$ ) and nutrition skills ( $\chi^2=10.17$ ,  $p=0.006$ ) than those who were not engaged in continuing education. [Table 3](#) outlines the positive associations between physicians' demographic characteristics and their nutrition competence scores.

All four constructs of physicians' nutrition competence were significantly associated with their provision of nutrition care. The closest correlations were between physicians' confidence in their nutrition knowledge ( $r=0.57$ ) and nutrition communication ( $r=0.52$ ) with their provision of nutrition care as shown in [table 4](#).

Three factors were identified as predicting of whether physicians provide nutrition care to patients: confidence in counselling about nutrition ( $p<0.001$ ), having previous nutrition education ( $p=0.005$ ) and a higher professional qualification ( $p=0.008$ ), as outlined in [table 5](#).

## DISCUSSION

This study investigated primary care physicians' competence in providing nutrition care to patients living with diet-related chronic disease. The findings are important given the increasing demand for primary care physicians to provide nutrition care to patients with diet-related chronic conditions, such as cardiovascular disease, obesity and type 2 diabetes. Positive attitudes toward incorporating nutrition care in the management of patients living with diet-related chronic disease were found. This is consistent with other studies conducted around the world, which indicated that primary care physicians realise nutrition care as an important aspect of their clinical practice.<sup>14 19–21</sup>

Physicians' self-perceived nutrition communication was high in comparison with other constructs, even higher than levels reported by Smith *et al*<sup>22</sup> who surveyed primary care residents in the USA. Results of physicians in the

present study suggest that they can build trust with their patients and effectively communicate and understand their concerns, which in turn will allow them to influence their dietary behaviours.<sup>23</sup> A higher mean communication score was seen for FM consultants when compared with other physician subgroups, which can be attributed to their greater experience.

The constructs in which physicians scored the lowest were confidence in nutrition knowledge and skills. Low nutrition knowledge was also reported by Dunic *et al*.<sup>24</sup> The results of the present study indicate that the greatest gain in competency would be achieved through strategies that focus on increasing physicians' nutrition knowledge and skills. Potential strategies are broader integration of nutrition knowledge and skill-building into medical training<sup>25</sup>; adoption of nutrition-competency assessments and standards<sup>25</sup>; more focus on nutrition care and its significant role in health and disease in conferences and departmental discussions. It is important to acknowledge that the NUTCOMP tool does not provide benchmark cut-offs for what is high and low.<sup>17</sup> As such, further work is required to clarify what benchmark is acceptable for effective healthcare practice.

Physicians differed in their nutrition competence based on their professional qualification. FM specialists had the highest mean knowledge score among all physicians (even higher than FM consultants). This could be attributed to recent training and fulfilment of their board (specialist) certification which includes nutrition care training.<sup>26</sup> Female physicians were more confident in their nutrition skills than males, which is consistent with other studies.<sup>27 28</sup> This difference might be due to female doctors holding longer consultations and being more likely to include lifestyle behavioural modification as part of routine care.<sup>29 30</sup>

This study found that only 29% of physicians reported counselling their patients about nutrition often/most of the time, similar to the low proportion (22%) reported by Khandelwal *et al*<sup>27</sup> and (19%) reported by Dunic *et al*.<sup>10</sup> Besides, 59% of present cohort spent less than 3 min on providing nutrition care during a routine visit. Ockene *et al*<sup>31</sup> reported that for nutrition counselling to be effective it must take 8 min or more. Alarming, the extent of nutrition care provided by this cohort is considerably less than might be expected from their positive attitudes toward nutrition care. It is of concern that such a low level in the provision of nutrition care would have negative clinical implications as many patients are likely to be missing out on nutrition care and the opportunity to potentially treat

**Table 5** Predictors for physicians' nutrition care practice

Predictor variable	Unstandardised coefficients B	T-test	P-value	95% CI
Communication	0.10	5.17	<0.001	0.06 to 0.14
Previous nutrition education	0.60	2.90	0.005	0.19 to 1.01
Professional qualification	0.29	2.73	0.008	0.08 to 0.50



their chronic disease and improve their health. Moreover, it may reduce the public health impact of primary care physicians. Greater incorporation of health behaviour change principles, such as motivational interviewing<sup>32</sup> and readiness to change model<sup>33</sup> into medical training, as well as positive role modelling by senior primary care physicians to ensure providing nutrition care as part of routine clinical practice are advised to support improved population health.

The closest correlations were between physicians' confidence in their nutrition knowledge and communication and their provision of nutrition care. Not having adequate knowledge was also the main reason provided for physicians' lack of nutrition counselling in similar studies.<sup>34 35</sup> These associations identified in present study indicate which aspects of physicians' competence are most likely to influence their nutrition practices. Therefore, to increase the level of nutrition care provided to patients, strategies that increase nutrition knowledge and communication are warranted. Such strategies could include encouraging physicians to engage in continuing medical education in nutrition; training in counselling approaches; integrating nutrition care questions in medical license and board examinations with a minimum benchmark required to pass.

This study has some notable limitations. Surveyed physicians were employed by MOH, which is the major provider of primary healthcare in KSA, but there are other providers too. The self-reported design of the tool means that physicians may have reported socially acceptable answers. Physicians' dietary habits were not investigated, which could be related to their provision of nutrition care. However, the strength of this survey lies in the validated tool used, high response rate and the representativeness of study sample with primary care physicians in KSA.

Future research is warranted to improve the nutrition competence of physicians through interventions or professional development (continuing medical education or role modelling). Improvements in nutrition competence may result in a greater frequency of nutrition care and improved patient outcomes, warranting attention.

## CONCLUSION

Primary care physicians felt confident in providing nutrition care to patients living with diet-related chronic disease, but their reported provision of nutrition care was limited in terms of frequency and time spent per visit. To enhance physicians' confidence and their provision of nutrition care, strategies that improve nutrition knowledge and skills are warranted. Developing consensus on the appropriate level of nutrition competence would be beneficial to inform continuing medical education and training at medical school.

**Correction notice** This article has been corrected since it was published. The headers for the Table 2 are updated.

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**Acknowledgements** We thank the Editage group for their help in ensuring this manuscript is of an exception standard of English language. We also wish to acknowledge all the physicians who took the time to complete the questionnaire and contribute to this study.

**Contributors** OA had the original idea for the paper, which was further developed in discussions with RS, LB and MAB. OA and HE conducted the pilot. OA, RS and HE collected the survey data reported in this study. HBUS led the statistical analysis. HBUS, OA and LB contributed to interpretation of findings and wrote the first draft of the manuscript. All authors contributed to the subsequent drafts and approved the final manuscript.

**Funding** This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. At the time of this project, LB's salary was supported by an Australian National Health and Medical Research Council fellowship.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** All deidentified participant data used in this study is available on reasonable request by contacting Dr. Osamah Al-gassimi: oalqasimi@moh.gov.sa

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## REFERENCES

- 1 Afshin A, Sur PJ, Fay KA, *et al*. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. *The Lancet* 2019;393:1958–72.
- 2 James SL, Abate D, Abate KH, *et al*. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the global burden of disease study 2017. *The Lancet* 2018;392:1789–858.
- 3 Institute for Health Metrics and Evaluation. Saudi health interview survey (SHIS), 2017. Available: [www.healthdata.org/sites/default/files/files/Projects/KSA/Saudi-Health-Interview-Survey-Results.pdf](http://www.healthdata.org/sites/default/files/files/Projects/KSA/Saudi-Health-Interview-Survey-Results.pdf) [Accessed 23 Feb 2019].
- 4 Ball LE, Hughes RM, Leveritt MD. Nutrition in general practice: role and workforce preparation expectations of medical educators. *Aust J Prim Health* 2010;16:304.
- 5 Ball L, Leveritt M, Cass S, *et al*. Effect of nutrition care provided by primary health professionals on adults' dietary behaviours: a systematic review. *Fam Pract* 2015;28:cmv067–17.
- 6 Ball L, Desbrow B, Leveritt M. An exploration of individuals' preferences for nutrition care from Australian primary care health professionals. *Aust J Prim Health* 2014;20:113.
- 7 Hiddink GJ, Hautvast JG, van Woerkum CM, *et al*. Consumers' expectations about nutrition guidance: the importance of primary care physicians. *Am J Clin Nutr* 1997;65:1974S–9.
- 8 Cornuz J, Ghali WA, Di Carlantonio D, *et al*. Physicians' attitudes towards prevention: importance of intervention-specific barriers and physicians' health habits. *Fam Pract* 2000;17:535–40.
- 9 Kolasa KM, Rickett K. Barriers to providing nutrition counseling cited by physicians. *Nutr Clin Pract* 2010;25:502–9.
- 10 Dumic A, Miskulin I, Matic Licanin M, *et al*. Nutrition counselling practices among general practitioners in Croatia. *Int J Environ Res Public Health* 2017;14:1499.
- 11 Verma S, Paterson M, Medves J. Core competencies for health care professionals: what medicine, nursing, occupational and physiotherapy share. *J Allied Health* 2006;35:109–15.
- 12 Vetter ML, Herring SJ, Sood M, *et al*. What do resident physicians know about nutrition? an evaluation of attitudes, self-perceived proficiency and knowledge. *J Am Coll Nutr* 2008;27:287–98.

- 13 Bleich SN, Bennett WL, Gudzone KA, *et al.* National survey of US primary care physicians' perspectives about causes of obesity and solutions to improve care. *BMJ Open* 2012;2::e001871..
- 14 Crowley J, O'Connell S, Kavka A, *et al.* Australian general practitioners' views regarding providing nutrition care: results of a national survey. *Public Health* 2016;140:7–13.
- 15 Alfadda A, Al-Dhwayan M, Alharbi A, *et al.* The Saudi clinical practice guideline for the management of overweight and obesity in adults. *Saudi Med J* 2016;37:1151–62.
- 16 Saudi Ministry of Health. Annual Statistical Book, 2017. Available: [www.moh.gov.sa/en/Ministry/Statistics/book/Documents/ANNUAL-STATISTICAL-BOOK-1438H.pdf](http://www.moh.gov.sa/en/Ministry/Statistics/book/Documents/ANNUAL-STATISTICAL-BOOK-1438H.pdf) [Accessed 24 Jul 2019].
- 17 Ball LE, Leveritt MD. Development of a validated questionnaire to measure the self-perceived competence of primary health professionals in providing nutrition care to patients with chronic disease. *Fam Pract* 2015;35:cmv073–10.
- 18 Davis DA, Mazmanian PE, Fordis M, *et al.* Accuracy of physician self-assessment compared with observed measures of competence. *JAMA* 2006;296.
- 19 Keaver L, O'Meara C, Mukhtar M, *et al.* Providing nutrition care to patients with chronic disease: an Irish teaching hospital healthcare professional study. *Journal of Biomedical Education* 2018;2018:1–7.
- 20 Hseiki RA, Osman MH, El-Jarrah RT, *et al.* Knowledge, attitude and practice of Lebanese primary care physicians in nutrition counseling: a self-reported survey. *Prim Health Care Res Dev* 2017;18:629–34.
- 21 Dumic A, Miskulin I, Pavlovic N, *et al.* Attitudes toward nutrition care among general practitioners in Croatia. *J Clin Med* 2018;7.
- 22 Smith S, Seeholzer EL, Gullett H, *et al.* Primary care residents' knowledge, attitudes, self-efficacy, and perceived professional norms regarding obesity, nutrition, and physical activity counseling. *J Grad Med Educ* 2015;7:388–94.
- 23 Chandra S, Mohammadnezhad M, Ward P. Trust and communication in a Doctor- patient relationship: a literature review. *J Health Commun* 2018;03.
- 24 Dumic A, Miskulin M, Pavlovic N, *et al.* The nutrition knowledge of Croatian general practitioners. *J Clin Med* 2018;7.
- 25 Aspary KE, Van Horn L, Carson JAS, *et al.* Medical nutrition education, training, and competencies to advance Guideline-Based diet counseling by physicians: a science Advisory from the American heart association. *Circulation* 2018;137:e821–e841.
- 26 Saudi Council for Health Specialities.. Saudi board of family medicine curriculum, 2016. Available: <https://www.scfhs.org.sa/MESPS/TrainingProgs/TrainingProgsStatement/Documents/Family%20Medicine%202020.pdf> [Accessed 24 Jul 2019].
- 27 Khandelwal S, Zemore SE, Hemmerling A. Nutrition education in internal medicine residency programs and predictors of residents' dietary counseling practices. *J Med Educ Curric Dev* 2018;5.
- 28 Delnevo CD, Steinberg MB, Abatemarco DJ, *et al.* Correlates of clinical preventive practices among internal medicine residents. *Prev Med* 2003;36:645–51.
- 29 Schieber A-C, Delpierre C, Lepage B, *et al.* Do gender differences affect the doctor-patient interaction during consultations in general practice? results from the INTERMEDE study. *Fam Pract* 2014;31:706–13.
- 30 Bertakis KD. The influence of gender on the doctor-patient interaction. *Patient Educ Couns* 2009;76:356–60.
- 31 Ockene IS, Hebert JR, Ockene JK, *et al.* Effect of physician-delivered nutrition counseling training and an office-support program on saturated fat intake, weight, and serum lipid measurements in a hyperlipidemic population: worcester area trial for counseling in hyperlipidemia (Watch). *Arch Intern Med* 1999;159:725.
- 32 Rubak S, Sandbæk A, Lauritzen T, *et al.* Effect of "motivational interviewing" on quality of care measures in screen detected type 2 diabetes patients: a one-year follow-up of an RCT, ADDITION Denmark. *Scand J Prim Health Care* 2011;29:92–8.
- 33 Zimmerman GL, Olsen CG, Bosworth MF. A 'stages of change' approach to helping patients change behavior. *Am Fam Physician* 2000;61:1409–16.
- 34 Adamski M, Gibson S, Leech M, *et al.* Are doctors nutritionists? What is the role of doctors in providing nutrition advice? *Nutr Bull* 2018;43:147–52.
- 35 Kahan S, Manson JE. Nutrition counseling in clinical practice. *JAMA* 2017;318.