

SUBMITTED 9 APR 20

REVISIONS REQ. 14 JUL & 9 SEP 20; REVISIONS RECD. 16 AUG & 24 SEP 20

ACCEPTED 7 OCT 20

ONLINE-FIRST: APRIL 2021

DOI: <https://doi.org/10.18295/squmj.4.2021.029>

## **Knowledge, Attitudes and Practices Related to Dietary Supplements Amongst a Group of Palestinian Pharmacists**

**\*Mohammad Altamimi,<sup>1</sup> May Hamdan,<sup>2</sup> Manal Badrasawi,<sup>1</sup> Saad  
Allahham<sup>3</sup>**

*Departments of <sup>1</sup>Nutrition and food technology & <sup>3</sup>Pharmacy, An-Najah National University, Nablus, Palestine; <sup>2</sup>Department of Healthy and Therapeutic Nutrition, Palestine Polytechnic University, Hebron, Palestine*

*\*Corresponding Author's e-mail: [m.altamimi@najah.edu](mailto:m.altamimi@najah.edu)*

### **Abstract**

**Objective:** The use of dietary supplements DS has increased. With lack of related regulations, prescription of DS will depend on the pharmacist's knowledge. Hence, the study aimed to evaluate the knowledge attitudes and practices (KAP) related to DS amongst community-based pharmacists. **Methods:** The study followed a cross sectional design targeted community pharmacists in Palestine. Selected participants have filled a self-administered questionnaire regarding their KAP related to DS. The questionnaire contained in total 15 items; knowledge 5, practices 7 and attitudes 3 questions. **Results:** Results have shown that the representative sample had 56% female. Participants experience almost distributed equally over 0-5, 5-10 and >10 years. Also, the majority of the participants was the responsible pharmacist and/or the pharmacy owner. Overall, participants have shown moderate level in knowledge towards DS with mean score of  $3.68 \pm 1.1$  out of 5, the correct answers ranged from 3.6% to 75.3% of the surveyed participants. The practices with highest frequencies were: taking DS sometimes 79.9%, taking supplements from well-known brands 56.2%, giving supplements to any patient 55.7%, selling supplements according to the participants' knowledge 74.2% and providing advice about supplements 73.2%. The questions about the pharmacists' attitudes towards organising the regulation of the market of DS showed that

more than half 52% of the participants believed that it was suitable. Association between knowledge score and practices was highly significant ( $P < 0.001$ ). **Conclusion:** The study has revealed that participants were moderate in their knowledge about DS. Also, there was a high connection between knowledge and practices.

**Keywords:** Dietary Supplements; Pharmacist; Knowledge; Attitude; Practice; Curriculum.

### **Advances in knowledge**

- The study is the first in Palestine to highlight the KAP related to DS amongst pharmacists.
- The study scored the knowledge and practice of the pharmacists which was revealed to be moderate.
- The study helped to identify the gap in pharmacists' KAP as frontline health care providers and suggested solutions to bridge such a gap.

### **Application to patient care**

- Addressing such gap in pharmacists' KAP will positively improve the service provided to patients who use DS.

### **Introduction**

Theoretically, dietary supplements are seen as isolated and highly concentrated nutrients and other substances such as herbs and botanicals, sport and weight-loss supplements, and meal replacements in forms of pills, capsules, powders or liquids designed to be taken in doses supplementing a diet.<sup>1,2</sup> DS conventionally used to compensate for a low diet or at least an easy way to stay healthy.<sup>1</sup> In developed countries, the number of adults using multivitamins/mineral supplements is increasing (more than 60% among adults), especially in age-group >60 years.<sup>1</sup> This has been estimated to be \$30.7 billion spent on vitamins and nutritional supplements in the USA alone in 2018.<sup>3,4</sup> Another study shows that one-third of adolescents were using supplements; half of them were taking it on a daily basis.<sup>3</sup> Less than half of the population in the UK are also reported to use DS.<sup>4</sup> Moreover, parents using supplements are more likely to use it for their infants and toddlers (age 4-24 months). Briefel, *et al.* have estimated the prevalence of DS use as 19% in infants and toddlers.<sup>2</sup>

Research shows that several attributes have led individuals to take DS. Basically, maintaining health and wellbeing, providing the body with nutrients that are deficient in the food and improving performance (cognitively and physically) are of the main categories behind DS intake.<sup>5,6</sup> Positive belief about DS is common amongst individuals in these categories. For example, ‘the best I can do for myself’; ‘ help me to be healthy’ and ‘ the easy way to stay healthy’ are expressed by many DS users.<sup>7</sup> On the other hand, it is critical to mention that DS intake is associated with other factors such as gender, age, educational level, socio-economic status, place of residence, and ethnicity.<sup>5,6</sup>

Previous studies have demonstrated that DS can help in reducing micronutrient deficiencies.<sup>1</sup> However, more recent studies reveal the fact that there is a prevalence of overconsumption (exceeding the tolerable upper intake level, UL) of minerals/vitamins from DS in the general population as well as in individuals of specific nutrition and health status, e.g. athletes, adolescents and obese.<sup>3</sup> Therefore, the increasing rate in consuming DS is not necessarily proportionate to the population needs, but also the level of over-dosing amongst the wider population remains high.<sup>7</sup> Blumberg, *et al.* (2017) have noticed that even though Multivitamins /multimineral use at any frequency is linked to a lower prevalence of inadequacy ( $P < 0.01$ ) for 15/17 nutrients examined. Furthermore, there has been an increased prevalence of intakes  $> UL$  for seven nutrients.<sup>8,9</sup>

Similarly, it is reported that people who are regular users of DS are those who are concerned about their health. Such people are found to have higher intakes of fruits and vegetables than non-users,<sup>4</sup> which may turn those people prone to overconsumption of minerals/vitamins and toxicity. It is also worth to mention that DS intake can be personally regulated without the supervision of health care professionals (e.g. nutritionist, dietitian, general practitioner, etc.).<sup>6</sup>

In the Middle East region, micronutrients deficiencies are becoming a public concern, particularly amongst children and women of childbearing age.<sup>10, 11</sup> One-third of the population, in this particular area, are iron and iodine-deficient; 50% of the people are dyslipidemic, and 65% are overweight or obese.<sup>10</sup> Despite the various recommendations about the importance of well-balanced diet with fruits and vegetables to meet the micronutrients and fibre requirements, the achievement of such a goal is relatively humble.<sup>10</sup> The long-term consequences can reach the stage of dysfunctionality in the cellular system and chronic diseases.<sup>10</sup> Using multivitamins can also be associated with a decrease in the risk

of chronic disease, as shown by some studies.<sup>4,10-12</sup> Therefore, it is expected that more people in the Middle East are going to use DS.

In many countries, DS is not subject to specific regulations,<sup>13</sup> and they can be sold over the counter. It is well-known that DS, primarily herbal, may interact with other prescribed drugs.<sup>14</sup> However, it is reported that in the USA, individuals prescribed drugs for chronic diseases also take DS.<sup>13</sup> This emphasises the fact that pharmacist knowledge and practices toward DS are crucial. As DS is widely sold in community pharmacies, this will pave the way for pharmacists to provide DS users with advice and discuss different choices. With no or insufficient knowledge, such a thing is doubtful, though.

Studies have highlighted that community pharmacists have poor knowledge of dietary and herbal supplements.<sup>14,16</sup> However, pharmacists seem to insist on contributing to the patient's requirements of the DS.<sup>5</sup> Reportedly, community pharmacists use unexpected sources of information about dietary and herbal supplements. They rarely use a reliable reference of topics that were not part of the pharmacy curriculum.<sup>5,11</sup> Therefore, pharmacists serving the frontline of the healthcare practitioners are required to be equipped with knowledge about DS alongside possible drug interactions. They are also required to provide their patients with an unbiased, evidence-based opinion about the healthy use of DS.<sup>16</sup> In countries like Palestine, Qatar, Kuwait, Jordan and Iran, it is reported that DS is one of the most recommended complementary alternative medicines suggested by pharmacists.<sup>17-19</sup> In the Palestinian context, for example, DS is taken by 12% of polypharmacy patients who are simultaneously taking other medications.<sup>20</sup> Therefore, the risk of a pharmacokinetic or pharmacodynamic interaction between drugs and DS is high amongst this group.<sup>13</sup> Such interaction is a huge concern, especially with some DS that contains pharmaceutical contaminants.<sup>5</sup> Therefore, as many studies highlight it, it appears urgent for pharmacists to know DS and more importantly, to offer a better professional, medical advice and guidance to patients.<sup>21,22</sup>

Examining the available literature provides that there is a paucity in the field where the level of knowledge and practices of the community pharmacists towards DS in Palestine require further exploration. Therefore, this study aims to evaluate KAP concerning DS and to create a link between knowledge and practices amongst community pharmacists in the West Bank, Palestine.

## Methods

A cross-sectional survey is conducted between September and December 2019 in the northern and southern districts of the West Bank, Palestine. Namely; Jenin, Tubas, Nablus and Tulkarem in the north and Hebron in the south. All visited pharmacies are public and non-governmental. The number of samples and distribution is based on the information published by the Palestinian National Center for Information (WAFA: [http://info.wafa.ps/ar\\_page.aspx?id=2996](http://info.wafa.ps/ar_page.aspx?id=2996)) in 2018, particularly in the northern districts; Jenin 119, Tubas 23, Nablus 166, Tulkarem 85 and in the southern district; Hebron 233 community pharmacies. The total number of licensed community pharmacies in the West Bank is about 942.<sup>16</sup>

A total of 252 questionnaires were distributed. However, 227 questionnaires were actually collected with, 90% response rate. The rest of the questionnaires either have missing data or have not been filled them properly. The following percentages of coverage are achieved: the northern districts 100 questionnaires (representing 25% of pharmacies in that area) and the southern districts 127 questionnaires (representing 64% of pharmacies in that area).

The questionnaire was adopted from the literature with modifications to suit the aim of the study.<sup>22</sup> It comprises of two parts. The first part is about personal and sociodemographic information including (gender, age, residency, work position, experience, marital status and health status) while the second part is about knowledge. It consists of five questions including (understand the term DS, decide which could be the type of DS, can you define DS, the source of knowledge about DS and knowing of the treatment of nutrients deficiency). In the practices section, there are seven questions including (taking DS, giving DS, recommending DS, to whom DS prescribed and who should prescribe DS). As for the attitudes section, there are three questions including (the reason you take DS, are pharmacists qualified to prescribe of DS and regulations of DS or toward DS).

For scoring, we adopt the scale from literature 10, where the correct answer in knowledge and practice is given (1) point while the incorrect answer was given (0) point. The scale of knowledge ranges from 0 to 5 (poor knowledge 0-2, medium three and knowledgeable 4-5) and for practices, it ranges from 0 to 7 (poor practices <3, satisfactory practice 4-5 and good

practice 6-7). In contrast, view towards the DS market has measured the attitudes of the participants.

The institutional review board (IRB) for this study was approved by the ethical review board, at An-najah National University and was given number (12). A direct verbal consent by each subject was obtained before filling the questionnaire, and the participation was completely voluntary without any monetary or non-monetary incentives. No names of participants were mentioned in the data extraction, and the raw data were solely used for research and not shared with a third party.

The Statistical Package for the Social Sciences (SPSS), version 21 was used to analyse the collected data, the selection of statistical tests according to variables types were done following Field (2009).<sup>23</sup>

The reliability test for the Knowledge items, Cronbach alpha, was 0.71 while for practice items were 0.65, which revealed acceptable reliability. The normality test was done for the nutritional knowledge scores using Kolmogorov Simonov test. Descriptive statistics, including the means and standard deviations, were used with interval data of the continuous dependent and independent variables, and the percentages used with the categorical variables. Independent t-test and one-way ANOVA tests were conducted to examine the relationship between the sociodemographic and the practices variables and the total score of the knowledge items at  $P < 0.05$ .

## Results

The total number of the pharmacists who have joined the study was 227 participants; only 194 participants were enrolled in the final analysis, as 33 participants were excluded due to missing data. Table 1 shows the demographic characteristics of the study participants presented in frequencies and percentages. The difference in the number of male and female participants was small (56.2% female to 43.8% male), 67.1% of the participants were married, majority of them were living in cities, 54.1%, were the responsible pharmacists, 37.1% of the participants have less than five years' experience, while 29.4% have 5-10 years of experience and 29.4% have more than ten years of experience.

Table 2 (Knowledge of the pharmacists with regard to the DS) shows participants knowledge about DS. Overall participants indicate a moderate level of knowledge regarding DS; the mean score was  $3.68 \pm 1.1$ . The range of the correct answers was from 3.6% (as in item 5) to 75.3% (as in item 2).

Table 3 (Practices and attitudes of the pharmacist with regard to DS) shows the participants practices and attitudes in using supplements presented in frequency and percentages. The major practices with high frequency were as follows: Taking supplements sometimes (79.9%), taking supplements from well-known brands (56.2%), giving supplements to any patients (55.7%), selling supplements according to their knowledge (74.2%), providing advice about supplements (73.2%). The questions about the pharmacists' attitudes towards organising the prescription, recommendation and regulation of the market of DS showed that more than half (52%) of the participants believed that it was suitable, as the majority of them believe that DS should be prescribed by a specialist (83%), recommended to people need them (81.4%) and regulated as it is now by the law (52.6%).

Table 4 presents the relationship between knowledge score and the sociodemographic variables. The results reveal no significant relationship between the knowledge score with the other variables, indicated by no significant means differences among the defined groups. The relationship between the level of knowledge and the practices regarding the DS is presented in Table 5. The results reveal a significantly higher score of knowledge for those who prescribe the supplements depending on price or the patients' needs or who rely on nutritionist referral to use the supplements. Meanwhile, a significantly lower score of knowledge is found amongst pharmacists who prescribe the supplements according to nutrients concentration or who reported that they specify the supplements to any patients.

## **Discussion**

Keeping up healthy eating habits and sufficient nourishment is not easy in the busy modern lifestyle. With rising awareness among individuals about wellbeing and counteracting sicknesses, utilisation of DS is widely spread. Different research investigations report that awareness concerning nutrition is expanding in the all-inclusive community and among special groups like athletes, individuals experiencing malignancy treatment, healthcare professionals and students.<sup>24,25</sup>

Recently, community pharmacist knowledge of DS is reported to be relatively poor despite acquiring a professional responsibility to provide advice about DS to the public. Researchers have found that 33.3% of Ethiopian pharmacists are poor in their knowledge repertoire in regard to DS while in other studies, this ranged between 40-60%.<sup>22</sup>

Generally speaking, pharmacies, considered to be a significant corner-stone of health framework, are in the right position to counsel clients with proof-based data about DS.

Pharmacists in the Palestinian community enjoy high social status. Being a pharmacist is considered one of the well-paid professions. Pharmacy students also are highly selected and enrolled in comprehensive range courses of pathology, pharmacognosy and ethics in pharmacology. Standardisation of student's knowledge about a specific topic is stated in the university mission by modifying or updating the curriculum. In this study, the researchers aim to shed light on one of the essential topics that may overlap between pharmacy and nutrition, i.e. DS. It seems that the current situation is not in the best of the consumer interest and there is a gap that requires to be filled by further actions from policymakers either at the university level or the pharmacist syndicate. This research paper has covered north and south of the west bank with 227 participants representing 24% of the community pharmacies.

Concerning the knowledge of pharmacists about DS, this study finds that one-third of the pharmacists understand the means of the term DS; meanwhile, 75% of them show correct knowledge about the types of DS. However, only 25% of the pharmacists correctly defined the meaning of the term of the DS, and only less than 10% of them knew about the methods for treatment of nutrient deficiency. A previous study conducted<sup>16</sup> in Palestine shows that pharmacists' knowledge about complementary alternative medicine (CAM) comes *fair to average* while their ability to answer patients' questions about CAM was inadequate. In a study conducted in Saudi Arabia, the majority of the participating pharmacists agreed about the importance of receiving more training and continuing education pertaining to herbal products.<sup>15</sup> The finding of another study<sup>22</sup> suggested that the majority of pharmacists had poor professional practice towards DS in spite of having adequate knowledge and a positive attitude regarding DS; so they suggested that emphasis should be given to teaching/training community pharmacists how to critically evaluate the use, efficacy, and safety of standard DS. Mehralian *et al.* conducted a similar survey in Tehran and found that 62% of the participant pharmacists showed weak knowledge about DS.<sup>19</sup> These results urge the need to

increase the awareness of the pharmacists about the DS. Moreover, another study revealed that people rely on the pharmacist's knowledge about DS; however, their knowledge has to be improved to achieve such a task.

On the other hand, the findings show that more than 10% of the pharmacists never took DS, while less than 10% of them used to take supplements, and the rest took supplements at sometimes. This means that pharmacists were convinced that DS somehow could help and support the wellbeing. Such results were in accordance with other findings in many studies,<sup>26-30</sup> where more than half of the participants consumed DS. Moreover, Howard *et al.* found that participants who personally took DS and recommended DS were twice the pharmacists who did not take DS personally and recommended DS to patients.<sup>24</sup>

In the current study, differences between knowledge scores are not significant between participants who take supplements and those who don't. The main drive for the high-scorer participants who took supplements was the price ( $P < 0.0001$ ). Another study conducted by Shraim *et al.* (2017), reveals that adequate knowledge is positively linked with pharmacist's years of experience;<sup>16</sup> in the same frame, another study by Alsayari *et al.* (2018) conclude that pharmacists with a master degree reported having a higher knowledge score than pharmacists with a bachelor degree;<sup>15</sup> Furthermore, pharmacists aged between 20 and 29 years have a higher knowledge score than older pharmacists. The majority of the sample were adults between 23-28 years meaning that they have 0-5 years of experience. Such result may explain the moderate scores achieved by the participants.

Practically, 75% of the pharmacists prescribe DS to any customer or patient asked for them. At the same time, only 25% of the pharmacists sell supplements to patients according to the advice of a physician. Knowledge has played a great role in such a decision as high-score pharmacists ( $P < 0.000$ ) sell DS according to their knowledge about the product quality, not due to price and availability. This reflects on the ethical responsibilities of pharmacists which entail offering advice based on scientific and approved information.

Moreover, findings show that 27% of the pharmacists tend to redirect patients to physicians or nutritionists while 73% of the pharmacists have provided advice to patients according to their knowledge. Pharmacists whose knowledge scores are higher prefer to redirect patients to nutritionists or physicians rather than taking responsibility to give advice. Such a result has

emphasised our initial statement about the necessity of increasing pharmacists' awareness and knowledge related to DS. Mehralian *et al.* have explored similar trends, where 45% of the pharmacists considered that supplements should be dispensed according to the nutritionist or physician's prescription.<sup>19</sup> Meanwhile, 60% of the pharmacists considered that supplements could be sold in the pharmacy under the pharmacist's supervision.<sup>19</sup>

Finally, half of the pharmacists have considered that the Palestinian regulations for exporting and importing DS are suitable. Meanwhile, 23% of the pharmacists have considered the Palestinian regulations in this regard relatively restricted, and a similar portion (23%) of the pharmacists consider these regulations very loose. Knowledge scores related to DS were similar among pharmacists with different attitudes towards the regulation, meaning that knowledge wasn't a significant player in taking such a decision.

The study has some limitations regarding sampling and the design, as cross-sectional study may have bias from responders and data collectors. However, we tried to make the sample as representative as possible. Moreover, interpretation of relationships between the outcomes and the prevalence of KAP wasn't easily generalised.

## **Conclusions**

The current study has shown that the majority of participants are moderate in terms of the acquirement of knowledge related to DS. This low level of knowledge is clearly likely to affect their practices in taking or giving DS. However, this level of knowledge has no relationship to their attitude to DS regulations. This has emphasised the need to promote a specific culture that actively supports knowledge enhancing and awareness rising of DS among pharmacists. In return, this can significantly better their decisions and advice, and make them scientifically based and systemically delivered away from other business-driven factors such as prices, brands or availability of products. It is also recommended that community pharmacists need to incorporate learning about CAM into their continuing professional development.<sup>12</sup> Such learning can form a step in the right direction where knowledge and practices can not only be about herbal medicine but also DS.

## **Acknowledgment**

The authors would like to thank everyone who has contributed to this study, especially distributing, filling, and collecting the questionnaires.

## Conflict of Interest

The authors declare no conflicts of interest.

## Funding

No funding was received for this study.

## References

1. Weeden A, Remig V, Holcomb CA, Herald TJ, Baybutt RC. Vitamin and mineral supplements have a nutritionally significant impact on micronutrient intakes of older adults attending senior centers. *J Nutr Elder*. 2010;29 2 :241-54.  
<https://doi.org/10.1080/01639366.2010.480897>
2. Briefel R, Hanson C, Fox MK, Novak T, Ziegler P. Feeding Infants and Toddlers Study: do vitamin and mineral supplements contribute to nutrient adequacy or excess among US infants and toddlers? *J Am Diet Assoc*2006;106 1 :52. e1-. e15.  
<https://doi.org/10.1016/j.jada.2005.09.041>
3. Stang J, T STORY M, Harnack L, Neumark-Sztainer D. Relationships between vitamin and mineral supplement use, dietary intake, and dietary adequacy among adolescents. *J Am Diet Assoc*. 2000;100 8 :905-10. [https://doi.org/10.1016/S0002-8223\(00\)00262-5](https://doi.org/10.1016/S0002-8223(00)00262-5)
4. Mason P. One is okay, more is better? Pharmacological aspects and safe limits of nutritional supplements. *Proc Nutr Soc India*. 2007;66 4 :493-507.  
<https://doi.org/10.1017/S0029665107005812>
5. Axon DR, Vanova J, Edel C, Slack M. Dietary supplement use, knowledge, and perceptions among student pharmacists. *Am J Pharm Educ*. 2017;81 5.  
<https://doi.org/10.5688/ajpe81592>
6. Balzo Vd, Vitiello V, Germani A, Donini LM, Poggiogalle E, Pinto A. A cross-sectional survey on dietary supplements consumption among Italian teen-agers. *PLoS One*. 2014;9(7):1-6. <https://doi.org/10.1371/journal.pone.0100508>
7. Lentjes MA. The balance between food and dietary supplements in the general population. *Proceedings of the Nutrition Society*. 2019;78(1):97-109.  
<https://doi.org/10.1017/S0029665118002525>

8. Blumberg JB, Frei BB, Fulgoni VL, Weaver CM, Zeisel SH. Impact of frequency of multi-vitamin/multi-mineral supplement intake on nutritional adequacy and nutrient deficiencies in US adults. *Nutrients*. 2017;9 8 :849. <https://doi.org/10.3390/nu9080849>
9. World Health Organization. World Health Organization-Regional Committee for the Eastern Mediterranean: statement by the delegate of Egypt. 1949.
10. Nielsen FH. Dietary magnesium and chronic disease. *Adv Chronic Kidney Dis*. 2018;25 3 :230-5. <https://doi.org/10.1053/j.ackd.2017.11.005>
11. Huang H-Y, Caballero B, Chang S, Alberg A, Semba R, Schneyer C, et al. Multivitamin/mineral supplements and prevention of chronic disease. *Evid Rep Technol Assess Full Rep* . 2006;139:1-117. <https://doi.org/10.1093/ajcn/85.1.265S>
12. Parian A, N Limketkai B. Dietary supplement therapies for inflammatory bowel disease: Crohn's disease and ulcerative colitis. *Curr Pharm Des*. 2016;22 2 :180-8. <https://doi.org/10.2174/1381612822666151112145033>
13. Asher GN, Corbett AH, Hawke RL. Common herbal dietary supplement-drug interactions. *Am Fam Physician GP*. 2017;96 2 :101-7.
14. Amadi CN, Mgbahurike AA. Selected Food/Herb-Drug Interactions: Mechanisms and Clinical Relevance. *Am j ther*. 2018;25 4 :e423-e33. <https://doi.org/10.1097/MJT.0000000000000705>
15. Alsayari A, Almghaslah D, Khaled A, Annadurai S, Alkhairy MA, Alqahtani HA, et al. Community pharmacists' knowledge, attitudes, and practice of herbal medicines in asir region, kingdom of Saudi Arabia. *J Evid Based Complementary Altern Med*. 2018;2018. <https://doi.org/10.1155/2018/1568139>
16. Shraim NY, Shawahna R, Sorady MA, Aiesh BM, Alashqar GS, Jitan RI, et al. Community pharmacists' knowledge, practices and beliefs about complementary and alternative medicine in Palestine: a cross-sectional study. *BMC Complement Altern Med*. 2017;17 1 :429. <https://doi.org/10.1186/s12906-017-1940-8>
17. Awaisu A, Kheir N, Ibrahim MIM, El-Hajj M, Hazi H, Khudair N, et al. Knowledge, attitudes, and practices of community pharmacists on generic medicines in Qatar. *nt J Clin Pharm*. 2014;36 2 :394-404. <https://doi.org/10.1007/s11096-013-9909-2>
18. Shilbayeh SA. Exploring knowledge and attitudes towards counselling about vitamin supplements in Jordanian community pharmacies. *Pharm Pract*. 2011;9 4 :242. <https://doi.org/10.4321/S1886-36552011000400010>

19. Mehralian G, Yousefi N, Hashemian F, Maleksabet H. Knowledge, attitude and practice of pharmacists regarding dietary supplements: A community pharmacy-based survey in Tehran. *Iran J Pharm Res: IJPR*. 2014;13 4 :1457.
20. Zyoud S, Abd-Alhafez A, Hussein A, Abu-Shehab I, Al-Jabi S, Sweileh W. Patterns of use of medications, herbal products and nutritional supplements and polypharmacy associating factors in Palestinian geriatric patients. *Eur Geriatr Med*. 2014;5 3 :188-94.  
<https://doi.org/10.1016/j.eurger.2013.11.004>
21. Shields KM, McQueen CE, Bryant PJ. Natural product education in schools of pharmacy in the United States. *Am J Pharm Edu*. 2003;67 1/4 :43.  
<https://doi.org/10.5688/aj670110>
22. Emiru YK, Belay YB, Bizuneh GK, Tegegn HG. Community Pharmacists' Knowledge, Attitude, and Professional Practice Behaviors Towards Dietary Supplements: Results from Multi-Center Survey in Ethiopia. *Nutr Diet Suppl*. 2019;11:59-68. <https://doi.org/10.2147/NDS.S222114>
23. Field A. *Discovering statistics using SPSS: and sex and drugs and rock'n'roll* : Sage; 2009.
24. Howard N, Tsourounis C, Kapusnik-Uner J. Dietary supplement survey of pharmacists: personal and professional practices. *J Altern Complement Med*. 2001;7 6 :667-80. <https://doi.org/10.1089/10755530152755225>
25. Sasanfar B, Toorang F, Nemati S, Djazayery A, Zendehtdel K. Development and validation of a knowledge, attitude, and practice questionnaire on nutrition-related cancer prevention for Iranian women. *J Res Med Sci.: the official journal of Isfahan University of Medical Sciences*. 2019;24. [https://doi.org/10.4103/jrms.JRMS\\_777\\_18](https://doi.org/10.4103/jrms.JRMS_777_18)
26. Holick MF, Biancuzzo RM, Chen TC, Klein EK, Young A, Bibuld D, et al. Vitamin D2 is as effective as vitamin D3 in maintaining circulating concentrations of 25-hydroxyvitamin D. *The J Clin Endocrinol Metab*. 2008;93 3 :677-81.  
<https://doi.org/10.1210/jc.2007-2308>
27. Sharma A, Adiga S. Knowledge, attitude and practices related to dietary supplements and micronutrients in health sciences students. *J Clin Diagn Res: JCDR*. 2014;8 8 :HC10. <https://doi.org/10.7860/JCDR/2014/9329.4683>
28. Woodside JV, McCall D, McGartland C, Young IS. Micronutrients: dietary intake v. supplement use. *Proc Nutr Soc India*. 2005;64 4 :543-53.  
<https://doi.org/10.1079/PNS2005464>

29. Teng CL, Tey KK, Lim PH, Cheng SF, Nordin MS, Ng CM, et al. Dietary supplements: usage and opinions among health sciences students. *Int e-J Sci Med Edu.* 2008;2 2 :30-2.

30. Spencer EH, Bendich A, Frank E. Vitamin and mineral supplement use among US medical students: A longitudinal study. *J Am Diet Assoc.* 2006;106 12 :1975-83.

<https://doi.org/10.1016/j.jada.2006.09.003>

**Table 1:** Sociodemographic characteristics for the participants presented in numbers and %; total number (n) was 194

| Variable            |                        | n       | Percentage |
|---------------------|------------------------|---------|------------|
| Gender              | Male                   | 85      | 43.8       |
|                     | Female                 | 109     | 56.2       |
| Age                 | 23-28 years            | 113     | 58.2       |
|                     | 29-33                  | 3       | 1.5        |
|                     | 34-39                  | 33      | 17         |
|                     | More than 40           | 45      | 23.2       |
|                     | Marital status         | Married | 49         |
| Marital status      | Married with children  | 81      | 41.8       |
|                     | Single                 | 64      | 33         |
|                     | Other                  | 0       | 0          |
| Area of living      | City                   | 148     | 76.3       |
|                     | Village/camps          | 46      | 23.7       |
| Work position       | Responsible pharmacist | 105     | 54.1       |
|                     | Assistant pharmacist   | 32      | 16.5       |
|                     | Pharmacy owner         | 57      | 29.4       |
| Years of experience | Less than 5years       | 72      | 37.1       |
|                     | 5-10 years             | 57      | 29.4       |
|                     | More than 10 years     | 65      | 33.5       |
| Chronic disease     | No                     | 179     | 92.3       |
|                     | Yes                    | 15      | 7.7        |

**Table 2:** Knowledge of the pharmacists with regard to the DS

| Item number | Item                                       | Correct answer N% | Wrong answer N% |
|-------------|--|-------------------|-----------------|
| 1           | Understand the means of the term DS        | 65 33.5           | 129 66.5        |
| 2           | Which of the following could be type of DS | 146 75.3          | 48 24.7         |
| 3           | The definition for DS                      | 51 26.3           | 143 73.7        |
| 4           | The source of knowledge about DS*          | 117 60.3          | 77 39.7         |
| 5           | Treatments of nutrients deficiency methods | 7 3.6             | 187 96.4        |

DS = Dietary supplement.

\*This item was assessed according to the reliability of the sources.

**Table 3:** Practices and attitudes of the pharmacist with regard to DS

| Item  | Answers   | N, %      |
|---|---|-----------|
| I take DS   | Never   | 21, 10.8  |
|   | Sometimes*  | 155, 79.9 |
|   | Often <sup>†</sup>                                    | 18, 9.3   |
| I take DS if  | The brand is familiar, well known or trusted          | 109, 56.2 |
|   | The price is reasonable within my budget or free      | 32, 16.5  |
|   | The ingredients are high in concentration             | 53, 27.3  |
| Usually I give DS to  | Any customer buys them                                | 36, 18.6  |
|   | Any patient requires them                             | 108, 55.7 |
|   | Anyone referred by physician                          | 49, 25.3  |
| I sell DS according to  | Availability, whatever I have in my pharmacy          | 35, 18    |
|   | My knowledge about the quality of product source, etc | 144, 74.2 |
|   | To price of product                                   | 15, 7.7   |
| If a patient asks for an advice about DS, you                     | Redirect them to the physician                        | 20, 10.3  |
|   | Redirect them to the nutritionist                     | 32, 16.5  |
|   | Provide advice as I know                              | 142, 73.2 |
| DS should be prescribed by:                                       | Anyone with no restriction                            | 8, 4.1    |
|   | Specialized person                                    | 161, 83   |
|   | Pharmacists only                                      | 25, 12.9  |
| I recommend the use of DS to                                      | Every one   | 34, 17.5  |
|   | Persons who need them                                 | 158, 81.4 |
|   | No one  | 2, 1%     |
| In Palestine, the DS regulations exporting and importing etc. are | Suitable  | 102, 52.6 |
|   | Very restrictive                                      | 44, 22.7  |
|   | Very loose  | 46, 23.7  |

DS = Dietary supplement.

\*less than 3 times a month. <sup>†</sup>once to twice a week.

**Table 4:** The relationship between the knowledge score and the sociodemographic variables

|        |      | Mean | SD  | P value            |
|--------|------|------|-----|--------------------|
| Gender | Male | 3.68 | 1.1 | 0.939 <sup>1</sup> |

|                             |                        |      |      |                    |
|-----------------------------|------------------------|------|------|--------------------|
| Age                         | Female                 | 3.67 | 1.1  | 0.499 <sup>2</sup> |
|                             | 23-28 years            | 3.69 | 1.01 |                    |
|                             | 29-33                  | 3.67 | 2.1  |                    |
|                             | 34-39                  | 3.42 | 1.3  |                    |
| Marital status              | More than 40           | 3.8  | 1.2  | 0.589 <sup>2</sup> |
|                             | Married                | 3.53 | 1.2  |                    |
|                             | Married with children  | 3.73 | 1.3  |                    |
| Area of living              | Single                 | 3.7  | 0.9  | 0.839 <sup>1</sup> |
|                             | City                   | 3.66 | 1.1  |                    |
| Work position               | Village / camps        | 3.8  | 1.6  | 0.14 <sup>2</sup>  |
|                             | Responsible pharmacist | 3.62 | 1.2  |                    |
|                             | Assistant pharmacist   | 4.03 | 1.2  |                    |
| Years of experience         | Pharmacy owner         | 3.58 | 0.9  | 0.567 <sup>2</sup> |
|                             | Less than 5years       | 3.75 | 0.9  |                    |
|                             | 5-10 years             | 3.72 | 1.2  |                    |
| Presence of chronic disease | More than 10 years     | 3.55 | 1.3  | 0.318 <sup>1</sup> |
|                             | No                     | 3.64 | 1.1  |                    |
|                             | Yes                    | 4    | 0.9  |                    |

<sup>1</sup>Not significant using independent sample t-test. <sup>2</sup>Not significant using one-way ANOVA test.

**Table 5:** The relationship between the participant's practices and attitudes regarding the DS

| Item                   |  | Means $\pm$ SD | P value             |
|------------------------|--|----------------|---------------------|
| I take DS              | Never  | 3.7 $\pm$ 1.3  | 0.789               |
|                        | Sometimes  | 3.7 $\pm$ 1.1  |                     |
|                        | Often  | 3.5 $\pm$ 1.3  |                     |
| I take DS if           | The brand is familiar, well known or trusted           | 3.7 $\pm$ 1.0  | 0.0001 <sup>1</sup> |
|                        | The price is reasonable within my budget or free       | 4.5 $\pm$ 1.1  |                     |
|                        | The ingredients are high in concentration              | 3.2 $\pm$ 1.1  |                     |
| Usually I give DS to   | Any customer buys them                                 | 2.75 $\pm$ 1.2 | 0.0001 <sup>1</sup> |
|                        | Any patient requires them                              | 4.1 $\pm$ 0.9  |                     |
|                        | Anyone referred by physician                           | 3.4 $\pm$ 0.9  |                     |
| I sell DS according to | Availability, whatever I have in my pharmacy.          | 3.0 $\pm$ 1.4  | 0.0001 <sup>1</sup> |
|                        | My knowledge about the quality of product source, etc. | 3.9 $\pm$ 1    |                     |
|                        | To price of product.                                   | 3.4 $\pm$ 1.1  |                     |

|  |                                    |           |                     |
|--|------------------------------------|-----------|---------------------|
| If a patient asks for an advice about DS, you                    | Redirect them to the physician.    | 3.3 ± 1.1 |                     |
|  | Redirect them to the nutritionist. | 4.9 ± 1.1 | 0.0001 <sup>1</sup> |
|  | Provide advice as I know.          | 3.5 ± 0.9 |                     |
| DS should be prescribed by:                                      | Anyone with no restriction.        | 2.2 ± 1.3 | 0.0001 <sup>1</sup> |
|  | Specialized person                 | 3.9 ± 1.0 |                     |
|  | Pharmacists only.                  | 2.9 ± 1.0 | 0.0001 <sup>1</sup> |
| I recommend the use of DS to                                     | Every one.                         | 2.6 ± 1.0 |                     |
|  | Persons who need them.             | 3.9 ± 1.0 |                     |
|  | No one.                            | 2.0 ± 1.4 |                     |
| In Palestine the DS regulations exporting and importing etc. are | Suitable.                          | 3.7 ± 1.1 | 0.745               |
|  | Very restrictive.                  | 3.7 ± 1.5 |                     |
|  | Very loose.                        | 3.6 ± 1.0 |                     |

DS = Dietary supplement.

<sup>1</sup>Significant  $P < 0.01$  using Chi Square test.