

Evaluation of Evidence-Base Practice among Eye Care Practitioners in Saudi Arabia- A Cross Sectional Survey Study

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Abstract

Background: The importance of evidence-based optometry practice in the current era of expanding role of optometry cannot be overemphasized. With many optometrists being involved in the diagnosis, management and co-management of various eye diseases, there is need to assess the quality of evidence-based used in their clinical decision making.

Methods: A self-administered survey that was made available via emails was administered to practicing optometrists in Saudi Arabia. Responses were analyzed descriptively and Chi squared test was performed to determine the level of association between practitioner characteristics and sources of evidence.

Results: A hundred and fourteen optometrists (62% men, 38% females) aged 31.0 ± 7.1 years with an average of 7.2 years of experience completed the survey (response rate 53%). The four most important factors they identified which underpinned their clinical decision making in their order of ranking were; patients' signs and symptoms (86%), knowledge and information gained during the postgraduate training/continuing education (64%), undergraduate optometry training (46%) and internet databases such as Pubmed and Medline (45%). About 45% indicated that they did not read scientific journals regularly, but depended on text books for information. For those who often read peer reviewed journals, *Optometry and Vision Science* (42%), *Saudi Ophthalmology Journal* (19%) and *Clinical and Experimental Optometry* (18%), journals were the most common. Approximately, 68% had made some modifications in their clinical decisions based on new evidence from literatures gleaned from test books, within the last two years especially in the nature of their soft contact lens practice and subjective refraction. Only 59% completed the minimum hours of continuous education required for license renewal and for about two-third of the respondents (68%), this was primarily sourced from local seminars offered by the Saudi Association of Optometry and Vision Scientist.

Conclusion: Saudi optometrists appear to use evidence that is not "up to date" or 'high level' and that does not support evidence-based practice. The findings suggest the need to re-educate Saudi Optometrists on how and where to search for, and the importance of using current evidence rather than being dependent on information provided by their educators.

Keywords: Evidence Based Practice; Clinical Decision-Making; Scientific Journals; Saudi Arabia; Education; Eye Care Practitioner

Abbreviations

EBP: Evidence Based Practice; EBM: Evidence Based Medicine; SAOVS: Saudi Association of Optometrist and Vision Scientists; CE: Continuous Education; HCP: Health Care Practitioner

Introduction

The theoretical foundations and practical applications of evidence-based practice are applicable not only in general medicine, but in allied health, including eye care [1-4]. Evidence-based practice (EBP) means integrating the best available clinical research evidence with individual clinical expertise [4,5] and at the top of the pyramid of evidence-based medicine are the prospective, randomized clinical trials and meta-analysis [6,7]. The more recent evidence-based movement in clinical practice that has generated so much debate categorically focuses on the use of relevant research such as strong clinical trials to direct decision-making, as opposed to tradition, habit and 'expert opinion' of the old days [1,8], despite the controversies about the benefit of such an approach [9]. Whereas EBP has been adopted by various health professions, investigation into the quality of evidence used by Optometrists particularly in developing countries need to be assessed.

Evidence-based practice in health care has been defined as 'the conscientious, explicit and judicious use of current evidence in decision-making' [4]. Several studies [10-16] have found that health care practitioners (HCPs) rely on evidence obtained from personal subscriptions, print resources, and interpersonal communications for much of the information they need. The studies suggest that HCPs prefer readily available, relevant resources that require minimal time and money to obtain and that are convenient [16,17]. HCPs consistently report that peer-reviewed journals are their preferred source for reliable information, followed by consultations with professional colleagues, association meetings, continuing education courses and pharmaceutical representatives [18,19].

Optometrists are primary eye-care providers for a large proportion of the population globally [20] and in Saudi Arabia [21]. Their role includes the prescription of therapeutic drugs for treatment and management of ocular diseases, the co-management of glaucoma - at least in some western countries [15]. The scope of optometry practice is wider now than ever before, and a growing number of optometrists play important roles in many secondary and tertiary care hospitals [20,22]. With this expanding role, the need for a sound basis for clinical decision-making becomes even more apparent, and thus the discussions on the need for an evidence-based approach to optometry practice and in our institutions will continue [1,3,23,24].

Evidence-based optometry practice translates a clinical question to a searchable question, and then applies the outcome-based information to daily patient care. It takes a bottom-up approach that combines "individual clinical expertise and the best available external evidence, and neither alone are enough" [23]. This approach requires the practitioner to remain current with the literature and to apply it as appropriate when caring for a specific patient [3,25]. A good example of the evidence-based approach in eye care is the current management of patients who are at risk for low vision loss from age-related macular degeneration by relying on data from the Age-Related Eye Disease Study (AREDS) [26]. The AREDS study clearly demonstrated the efficacy of antioxidant therapy for patients with moderate to advanced retinal changes associated with age-related macular degeneration and showed no benefit to recommending treatment as a preventative measure for patients with mild or no signs of macular changes.

Despite the increasing number of evidence towards EBP in optometry and the increasing role of optometrists in primary eye care, only very few studies [15,27,28] have so far examined the evidence base used by optometrists in patient care decision making and in one study, time taken to search for evidence was identified as a major barrier [16]. While one study was a cross-sectional survey of the current practice of UK optometrists and ophthalmologists in relation to advice given on diet and other lifestyle modifications for patients with or at risk of Age related macular degeneration (AMD) [27], the other investigated the evidence based used by Australian Optometrists in the care and management of dry eye patients [28]. However, only the study in Australia [28] so far was able to actually assess the general use of EBP by optometrists. With the results thus provided by these studies and the poor reading habit of the average Arab individual [29] coupled with the fact that Saudi Optometry plays a leadership role in Optometry practice in the Middle East and North African Region (MENA), there is need to explore the evidence based information used by Optometrists practicing in Saudi Arabia.

Aim of the Study

The aims of the study were to assess the forms of evidence used by optometrists in Saudi Arabia during clinical practice, investigate how the optometrists source for and use this evidence-based information in their clinical decision-making, and the limitations they experience in using some of these sources of evidence.

Materials and Methods

Study design

This study adopted a similar protocol to that used by Suttle, *et al.* [15] with a few modifications to specifically address the purpose of the study. The questions from the current study were considered by a panel of five optometrists working with the University clinic. The initial questionnaire, drafted in both English and Arabic language, was completed by another five randomly selected independent optometrists, who were not part of the study, to determine how the questions were interpreted and whether any further amendments or additions were appropriate. These questions were also checked for the similarity of the interpretation in both languages. The amended questionnaire was again completed by a different group of randomly selected optometrist (n = 5). The results (not shown) suggested that the questionnaire would be well received by the profession and that no misunderstanding of the questions had occurred in both languages. The final questionnaire shown in table 1 was sent out to Optometrists between September and November 2017 via emails.

Questionnaire for practicing Optometrists
Please take about 10 minutes to complete the survey that addresses the clinical relevance of information you have obtained during the practice of Optometry
1. Which of the following best describes the mode of optometric practice in which you work?
<input type="checkbox"/> Optical Chain <input type="checkbox"/> Private practice (e.g. single or partner owners)
<input type="checkbox"/> Academic <input type="checkbox"/> I do not practice
<input type="checkbox"/> Hospital Practice <input type="checkbox"/> Other (describe):
2. Please state the city of your main practice address:
.....
3. From which university did you graduate in optometry?
<input type="checkbox"/> King Saud University Male
<input type="checkbox"/> Qassim University
<input type="checkbox"/> King Saud University Female
<input type="checkbox"/> Albaha University Female
<input type="checkbox"/> -Other (please state):
4. In what year did you first graduate in optometry?
.....
5. Since your graduation, for how many years have you been practicing as an optometrist (excluding any significant periods of leave such as maternity leave)?
.....
6. Do you hold regular membership of any of the following professional organizations?
<input type="checkbox"/> Saudi Association of Optometrists and Vision Scientist
<input type="checkbox"/> British Contact Lens Association
<input type="checkbox"/> Australasian College of Behavioral Optometrists
<input type="checkbox"/> American Academy of Optometry
<input type="checkbox"/> Others (please state):
7. Which of these journals, if any, do you read regularly?
<input type="checkbox"/> Clinical and Experimental Optometry
<input type="checkbox"/> Journal of Behavioral Optometry
<input type="checkbox"/> Optometry and Vision Science
<input type="checkbox"/> Ophthalmic and Physiological Optics
<input type="checkbox"/> Saudi Ophthalmology Journal
<input type="checkbox"/> Other (please state):
<input type="checkbox"/> I do not regularly read scientific Journals
8. If you have answered yes to Q7, state how often you read these journals, on average?
<input type="checkbox"/> More than once a week
<input type="checkbox"/> Once a week to once a month
<input type="checkbox"/> Less than once a month
<input type="checkbox"/> Less than once in 6 months
<input type="checkbox"/> Less than once in a year

9. In your opinion, what factors could prevent optometrists from reading journals regularly:
<input type="checkbox"/> The journals are not sufficiently related to clinical practice
<input type="checkbox"/> Time limitations
<input type="checkbox"/> The journal articles are usually difficult to understand
<input type="checkbox"/> Journals are not accessible (e.g. too expensive)
<input type="checkbox"/> Other (please state):
10. This question relates to the sources of information that assist in your clinical decision making in practice. Select any factors used in your daily practice and RANK them in order of importance with '1' being the least important or useful to you and '4' being very important. Write the appropriate number in the box next to each relevant factor.
<i>Note that you can select more than one answer but that all answers may not be relevant to your own clinical decision making.</i>
<input type="checkbox"/> Professional mailing lists or discussion boards (e.g. vision express)
<input type="checkbox"/> Patient's signs, history and symptoms
<input type="checkbox"/> Knowledge and information gained in undergraduate optometric study
<input type="checkbox"/> Specialist internet sites (e.g. Contact Lens Spectrum)
<input type="checkbox"/> Knowledge and information gained in postgraduate (including continuous education) optometric study
<input type="checkbox"/> Knowledge and information gained from reading journals
<input type="checkbox"/> Advice and information from colleagues
<input type="checkbox"/> Product information provided by optical and/or pharmaceutical companies
<input type="checkbox"/> Official documents from government departments or professional associations
<input type="checkbox"/> Internet (e.g. Google) search
<input type="checkbox"/> Literature search using internet database (e.g. PubMed or Medline)
<input type="checkbox"/> Other (please state):
11. In the past two years, have you modified your clinical practices (e.g. changed your diagnostic criteria or your management plan for a particular abnormality) based on new information you obtained (e.g. from a journal article or a seminar, in which a clinically relevant research finding is described)? (Please tick appropriate answer)
<input type="checkbox"/> Yes <input type="checkbox"/> No
12. If 'yes', please indicate the source of the information:
<input type="checkbox"/> Journal article
<input type="checkbox"/> Advice or information from a colleague
<input type="checkbox"/> Information gained at a continuous education seminar
<input type="checkbox"/> Information gained in a postgraduate course
<input type="checkbox"/> Textbook
<input type="checkbox"/> Other (please state):
13. If you answered 'yes' to Q11, please describe briefly the nature of the modified clinical practice and please state the journal or textbook titles, if appropriate:
.....
14. Approximately how many hours of continuing education (CE) have you undertaken in the past year?
<input type="checkbox"/> < 10
<input type="checkbox"/> 10 to < 20
<input type="checkbox"/> 20 to < 40
<input type="checkbox"/> 40 to < 60
<input type="checkbox"/> 60 or more
15. Please briefly indicate where you have undertaken most of your CE
<input type="checkbox"/> Saudi Optometrist Association seminar series
<input type="checkbox"/> King Saud University College of Applied Medical science seminar series
<input type="checkbox"/> Qassim University College of Applied Medical Science seminar series
<input type="checkbox"/> Saudi Ophthalmology council seminar series
<input type="checkbox"/> Other (please state)
16. Tell us your age (Years) Sex: Male [] Female []
Country of origin
17. If you have any comments on evidence-based optometric practice, please provide here:
.....
Thank You

Table 1: Study questionnaire sample.

Data analysis

Questionnaires were included in the final analysis if they were completed by Optometrists (including interns) and excluded if the Optometrists had participated in the initial validation of this questionnaire. The results were entered into a Microsoft Excel spreadsheet, overlaid to eliminate data errors and corrected. Responses were analyzed using descriptive statistics and Chi squared test was performed to determine the level of association between practitioner characteristics and sources of evidence. The Graphpad Instat software (version 3.00 - Graphpad Software Inc., San Diego, CA) was used for all analyses. A P value < 0.05 (α) was considered statistically significant.

Results and Discussion

Response rate and demographics

One hundred and fourteen optometrists aged 31.0 ± 7.1 years (range 22 - 59 years) completed the questionnaire (response rate 52.5%). About two-third of the respondents were men ($n = 71, 62.3\%$). Respondents had an average of 7.2 ± 6.2 years of experience in practice, with 56.9 percent ($n = 82$) of respondents having been in practice for less than 10 years, 18.1% ($n = 26$) for more than ten years, and 4.2% ($n = 6$) have been unemployed following graduation. Figure 1a shows the respondents' mode of practice while figure 1b shows their practice locations. The figures indicated that the majority worked in hospital practices and only a few ($n = 15$) practiced outside the main city.

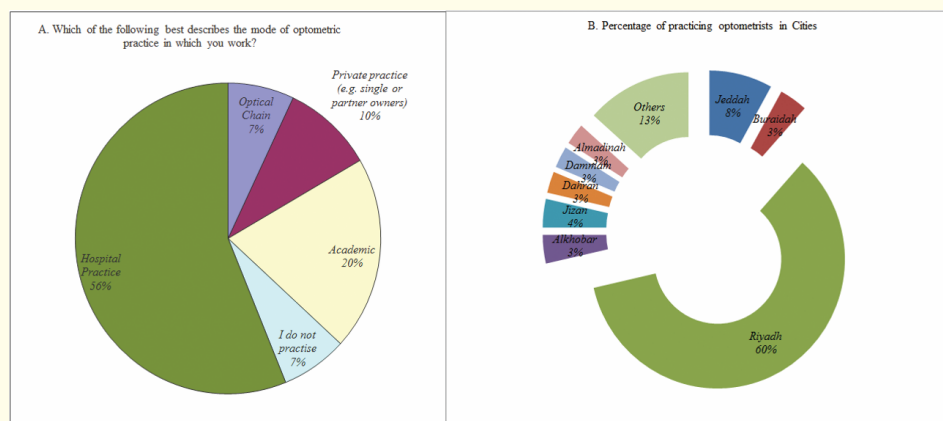


Figure 1: Percentage distribution of respondents ($n = 114$) according to: A), The mode of Optometry practice of respondents and B), practice location.

Sources of continuing education (CE) courses

A breakdown of the number of CE hours the respondents undertook the previous year showed that 17% completed < 10 hrs of CE, 24% between 10 to < 20 hrs, 30% between 20 to < 40 hrs, 16% between 40 to < 60 hrs and 13% completed 60hrs or more of CE. For about two-third (68.4%) of the respondents, this was primarily sourced from the Saudi Association of Optometry and Vision Science (SAOVS) meetings. A further 14.9 percent cited courses offered by universities as their main source of CE (King Saud University 13.2%, Qassim University 1.7%), and 12.3 percent obtained theirs from the Saudi Ophthalmology congress meetings. Others (4.4%) indicated a range of sources including seminars provided by contact lens companies such as the Johnson and Johnson vision training institute (1.8%), overseas conferences like the British Contact Lens Association meetings (1.8%) and online optometry education websites (Optometry Today, 0.9%) as their main source of CE.

Professional association membership and commonly-read journals

As is shown in figure 2, almost all respondents (94%) were active members of the local association (SAOVS) while some respondents also held memberships of other Optometry Associations including: the Optometry and Dispensing Opticians Board of Nigeria ($n = 4$,

3.5%); Saudi Ophthalmology Society (n = 5, 4.4%); International Association of Contact Lens Educators and College of Opticians Alberta (n = 1, 0.9%; each); while eleven respondents (9.7%) had no professional membership as at the study period.

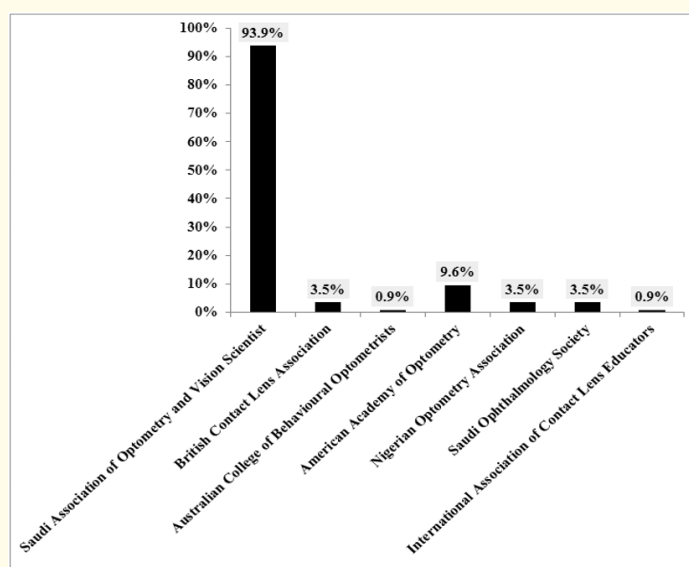


Figure 2: Percentage distribution of respondents' membership to professional associations.

Concerning the journals most commonly read, approximately 44.7 percent of respondents did not read scientific journals regularly, but for those who often did, the *Optometry and Vision Sciences* was the most widely read (42.1%). A breakdown of the selected journals commonly assessed by the Saudi Optometrists was shown in figure 3a. The percentages of responses exceeded 100% because some respondents indicated that they read more than one journal. Additionally, one to two respondents also indicated that they read other journals which were not in the listed options such as *Journal Cataract and Refractive Surgery*, *Contact Lens Spectrum*, *Journal Eye and Contact Lens Clinical Practice*, *Optometry Today*, *Optometry Times* and *Clinical Ophthalmology*. For the 63 respondents who indicated that they regularly read scientific journals, the number of reading hours each day, which was depicted in figure 3b, revealed that only 26% read the journals either once a week or once a month, while the rest seldom did. Many of the respondents attributed their infrequent reading of these journals to time limitations (36%) and the fact that the journals were not easily accessible to them (33.3%). Some also indicated that the articles in the journals were either not sufficiently related to their clinical practice (22.8%) or were difficult to understand (7.9%) and as such they seldom read the journal articles. Additionally, one or two respondents cited 'lack of knowledge' about the usefulness of the journal articles to Optometry practice as a contributing factor to the infrequently read of articles. Also, the abstract mode in which the statistical analyses were presented in the journal articles and the usefulness of such articles to non-research oriented optometrists were identified as factors that may have discouraged Saudi Optometrists from reading peer reviewed articles in journals.

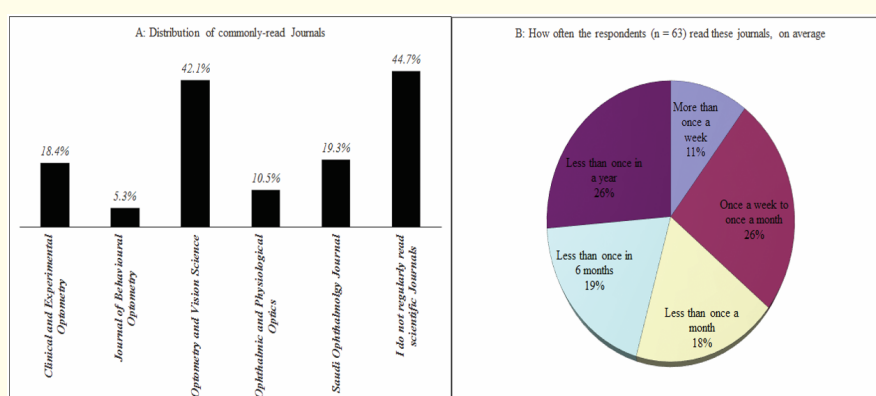


Figure 3: Percentage of respondents according to: A) The journals they read, and B), how often they read the journals.

Sources of evidence supporting clinical decision making

Respondents were asked to rank eleven forms of evidence in their order of importance as factors underpinning clinical decision-making. Table 2 presents the analysis of the responses. The table showed that eighty-six percent ranked patients’ signs and symptoms as the most important factor, followed by knowledge and information gained during the postgraduate optometry training. Information gained during undergraduate training was ranked the third most important factor that underpinned the clinical decision making. Other forms of evidence such as journal articles or official documents from government departments or professional associations received low ratings by Optometrists.

Answer Options (no of response)	Grading (%)				Rating Average
	Very important		Least important		
Professional mailing lists or discussion boards (e.g. vision express), n = 108	35 (32.4)	43 (39.8)	19 (17.6)	11 (10.2)	2.06
Patient’s signs, history and symptoms, n = 114	98 (86.0)	15 (13.2)	1 (0.9)	0 (0)	1.15
Knowledge and information gained in undergraduate optometric study, n = 114	52 (45.6)	51 (44.7)	8 (7.0)	3 (2.6)	1.67
Specialist internet sites (e.g. Contact Lens Spectrum), n = 114	46 (41.1)	46 (40.1)	16 (14.3)	4 (3.6)	1.8
†Knowledge and information gained in postgraduate (including CE) study, n = 112	72 (64.3)	34 (30.4)	5 (4.5)	1 (0.9)	1.42
Knowledge and information gained from reading journals, n = 113	31 (27.4)	42 (37.2)	31 (27.4)	9 (8.0)	2.16
Advice and information from colleagues, n = 111	47 (42.3)	42 (37.8)	19 (17.1)	3 (2.7)	1.8
Product information provided by optical and/or pharmaceutical companies, n = 112	31 (27.7)	41 (36.6)	33 (29.5)	7 (6.2)	2.14
Official documents from government departments or professional associations, n = 111	30 (27.0)	44 (39.6)	29 (26.1)	8 (7.2)	2.14

Table 2: Percentage analysis of response to questions relating to the sources of information that assists the Optometrists’ clinical decision making in practice.

†CE: Continuous Education. % were calculated per number of responses obtained for each question.

Approximately, sixty-eight percent (n = 77) stated that they had made some modifications in their clinical decisions based on new evidence from literature gleaned from textbooks, for instance, within the last two years. Others (32.5%) also indicated that their clinical decision-making process had not been modified based on information gained from the sources listed in figure 4, within the same two-year period. When asked to briefly describe the nature of the modified clinical practice, forty-three respondents (37.7%) provided responses describing the areas of modified clinical practice and thus were analyzed under relevant headings (Figure 5). From the figure 5, it can be deduced that the majority of respondents in this section had made changes to the nature of their soft contact lens (CL) practice and subjective refractive techniques using information gained from different evidence-based sources.

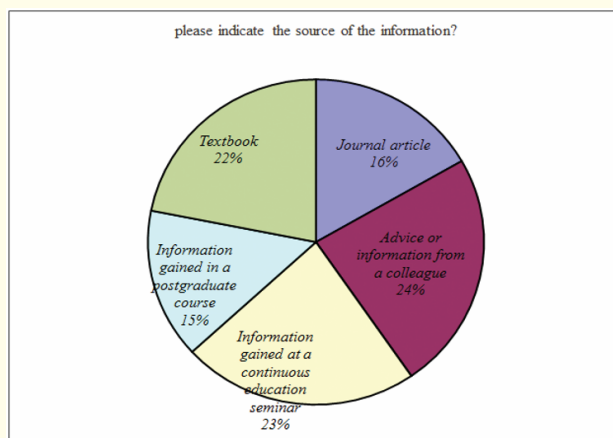


Figure 4: Percentage distribution of the major sources of evidence respondents (n = 77) used in modifying Optometrists’ clinical practice within the previous two years.

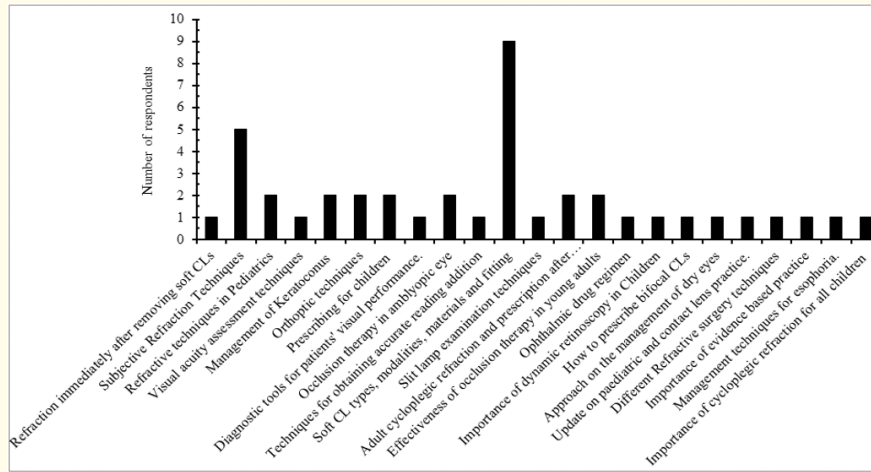


Figure 5: Percentage distribution description of Areas where respondents (n = 43) made changes in their clinical decision.

Assessing the association between practitioner’s characteristics and sources of evidence, it was observed that the respondents’ practice years was only significantly associated with the source of information underpinning their clinical decision-making (P < 0.001, see figure 6).

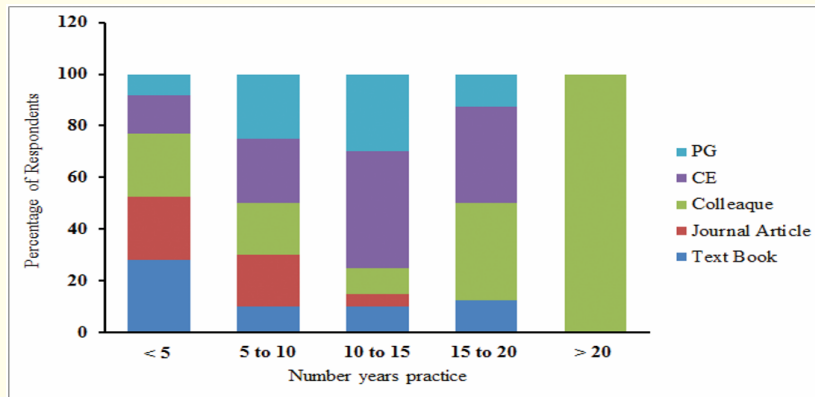


Figure 6: The percentage distribution of respondents who modified their clinical practice based on evidence from various sources and their categorized number of practice years of experience.

Comments on evidence-based practice

Twenty-eight respondents (24.6%) commented on evidence-based optometry practice (EBP) and most (19; 67.9%) of these could be categorized as broadly positive, indicating that EBP is important. Four (14.3%) were broadly negative, indicating that EBP is unimportant to current optometry practice in Saudi Arabia. Five (17.9%) of the comments were categorized as limitations to EBP. Two respondents mentioned keratoconus as an area where evidence of its etiology is particularly lacking, three felt poor access to evidence such as electronic journals was a significant barrier to evidence-based practice, while two others felt the optometry training institutions should incorporate evidence-based optometry practice as a course in their study curriculum. Examples of comments grouped into positive, negative, and barrier comments are depicted in table 3.

Positive	Negative	Limitations
1. EBP [†] is vital as it expands the practitioners knowledge	Need to change the practicing regulations in the country	Crowded clinic gives no space for reading
2. Prior to discussion on EBP but should be aligned with work practice experience	The limited scope of optometry practice limits the application of EBP	Journal sources that are offline
3. I would like to see article information sent by email		Employers are not interested
4. I would like to see more conferences organized in the Eastern Province		Poor salaries make it difficult to assess journals
5. Optometrists need more seminars on how to effectively use EBP		If possible, the SAOVS [†] should subscribe for journals and make them assessable to the optometrists via its website
6. It provides an indispensable and adequate way of practicing Optometry		
7. Modern day optometry practice should be based on EBP		
8. "Time for reading big textbooks is gone".		
9. There is need to improve our EBP so as to save the sight of Arab communities		
10. It is the bedrock of optometry practice, I am in favor of it		
11. The optometry training institutions should incorporate EBP In their course curriculum		

Table 3: Analysis of additional comments on evidence based optometry practice (EBP).

[†]SAOVS: Saudi Association of Optometrists and Vision Scientists.

Discussion

The response rate of 52.5% recorded in this study was higher than that of a similar study (7.8%) [15] conducted in New Zealand and Australia majorly because of the single geographical region (KSA), the limited sample size the current study was designed to cover, and the fact that the interest on evidence-based practice is more now than it was 2 years ago. This sample represents approximately 11.4 per cent (114/1000) of the estimated population of active optometrists in Saudi Arabia as at the time of this study. Also, in agreement with a previous survey conducted among optometrists in Saudi Arabia [21], respondents in this study had similar average years of experience in practice and were mostly practicing in hospitals as opposed to an earlier study from Australia and New Zealand where the majority were private practice optometrists [15]. Optometrist practicing in hospitals may be more aware of the importance of evidence-based practice compared to private optometrists due to their regular interactions with practitioners in other health care professions where the EBM is more widely recognized [30].

At the time of this survey, the Saudi Council for Health Specialties (SCFHS) which is the certifying board for all HCPs in the country requires every practicing optometrist to have completed at least 60 hours of accredited CE over a three-year period. The finding that more than one-half of the respondents in this study had completed 20 or more hours of CE in the previous year is consistent with this requirement. However, in countries with more stringent CE requirements such as Australia and New Zealand, Optometrists were shown to adhere to such regulations in very high numbers [15]. That a reasonable proportion of Optometrist (41.3%) only completed between 10 and 20 hours of CE the previous year suggests that the council needs to do more to encourage participation in CE programs. Since many of these respondents not meeting the guideline were those practicing outside the cities where CE courses are commonly organized. The Saudi Association of Optometry and Saudi Ophthalmology Council meetings were indicated as the primary sources of CE credit hours

by 81% of the respondents. These annual meetings are only commonly held in Riyadh thereby depriving optometrists in other cities of participation. In fact, this was also noted in additional comments by some optometrists (Table 2). There is therefore a need for alternative ways of providing accredited CE courses to optometrists to include those practicing in other parts of the kingdom or encouraging employers support to enable attendance. Re-education of optometrists on the importance of CE including improving self-esteem, increased confidence to handle difficult cases and the opportunities for promotion for those with higher qualifications might encourage uptake of CE courses [31].

Many of the respondents (44.7%) did not regularly read most journals. This could in part be attributed to the fact that the Saudi Optometry Association currently has no official journal or newsletter or partners any, and many of the respondents were not members of any other professional body that would offer some of the listed journals as benefit. A study conducted in Australia and New Zealand found that 87% of the 240 respondents regularly read the journal *Clinical and Experimental Optometry* which is the official journal of the local association 'Optometrists Association Australia and the New Zealand' [15]. In the current study, 42.1% regularly read the journal of *Optometry and Vision Science* while few (18.4%) also read journal *Clinical and Experimental Optometry*. Of the Six respondents (5.3%) who also read the *Journal of Behavioral Optometry* regularly, only one held membership of the organization distributing this journal, the Australian College of Behavioral Optometry. Only four of the 22 optometrists who read the local *Ophthalmology Journal*, held memberships of the affiliated body, the Saudi Ophthalmology Society, thus suggesting that a significant proportion of Saudi readers of these journals may have to pay to access them independently (without membership) or via limited open access and this was identified as a major barrier to use of EVB in a previous study [16]. It is important to state that three respondents regularly read a variety of scientific journals which were not optometry-related which was commendable and should be encouraged in the light of the current expanding scope of Optometry practice [22] and because many of the important articles for all disciplines are often published in broad-based healthcare journals rather than subspecialty or discipline-specific scientific journal [32].

Reading several journal articles critically on a regular basis might not be practical for the busy practice due to time constraints [16] and was the reason cited by some respondents who did not read journals regularly. Lack of time and inaccessibility of the journals were cited as the top two hindrances to reading journals regularly and even for those who indicated they regularly read journals, many of them do so only less frequently. A partial solution to time constraint and inaccessibility of Journals could be found in educating the Optometrists on making use of open-access journals and systematic review websites [3,16].

The finding that majority of the respondents identified the patients' signs and symptoms as the first most important factor they considered during clinical decision-making was consistent with the earlier report [15] and this is important because, patient's history, signs and symptoms provide core evidence in clinical decision-making [33]. Knowledge gained from post graduate (including continuing) and undergraduate education were also ranked as the first or second most important source of information by more than two-third of the respondents while more respondents than any other (except those who have modified their practice based on advice from a colleague) indicated that they have modified their practice in the previous two years based on information gained at a CE seminar or post graduate course. Such constant updates of knowledge and skills are needed to ensure a highly efficient workforce and necessary to provide the highest possible standards of care to patients [31].

Different sources of information provide an evidence-base that can be combined with clinical findings to reach a clinical decision [4] and with the advent of the internet and the proliferation of available clinical data and information, today's optometrists are provided with ever-increasing opportunity to acquire knowledge about specific topics. Among such sources of information, Journal articles are typically more current than textbooks [23]. In the current study, more optometrists sourced for evidence-based information using textbooks than journal articles which was different from the report from Australian Optometrists [15] and could reflect a cultural habit as previously reported among Saudi medical students [34]. The lack of skills to search for journal articles or the fact that the Optometrists may not have been told that textbooks are almost always dated and that current knowledge can only be accessed through publications were possible contributors to the non-use of current evidence. The fact that a large proportion of the respondents ranked as "very important" the use of online internet databases like Pubmed, or search engines like Google or even other optometry/ophthalmology web pages, to source for evidence-based information used for clinical decision-making (Table 2), indicates an opportunity for educational institutions and the

Optometry body to teach students and encourage the use of online databases that search multiple articles and synthesize the literature to provide meta-analysis was shown to be most effective in obtaining evidence-based information for the optometrists [23].

Advice or information received from colleagues was rated the first or second most important factor in the Optometrists' clinical decision-making. This is probably because the respondents understood that "experience precedes expertise" [33] as has been clearly demonstrated in a qualitative experimental study of adult, pediatric, and neonatal intensive care unit (ICU) nurses, more than 2 decades ago [35]. By learning from the experience of colleagues, the optometrists are more likely to avoid the mistakes made by their colleague. In this study, more experienced practitioners (10 - 20 years of experience) were more likely to modify their clinical-decision, based on information gained during CE while those with lesser years of practice experience (less than 10 years) were more likely to rely on text books for evidence used in modifying their clinical decision-making (Figure 6).

The study had some limitations as with any online-based survey. Firstly, the respondents were more likely to be those who read their emails and responded to them as surveys were sent via emails; Secondly, the reliability of the responses cannot be ascertained even though many of the concepts and questions asked in the questionnaire were simple and understandable and by providing a comprehensive list of choices, respondents would find the one best answer or add an "other" choice; Thirdly, there was no comprehensive database of optometrists practicing in Saudi Arabia at the time of this study and registration with SAOVS was not mandatory. Therefore, only emails of optometrists who were registered with the association were available, making it almost impossible that those who were not members of the association prior to the time of this study were reached. Fourthly, due to the great similarities in culture between the Middle Eastern countries, the findings of this study is a likely reflection of the attitude of Optometrists in this region. However, the subtle differences in culture and/or in the Optometry distribution in the other countries may influence the use of EVB among Optometrists in those countries and should be considered when interpreting the present results.

Conclusion

To the best of the authors' knowledge, this survey is the first to provide insights into a self-reported evidence-base used by optometrists in Saudi Arabia and Middle East at large, during patient care. It provided important information on the sources of evidence used by optometrists as a basis for their clinical decision-making, the frequency of use of this evidence, and the limitations some optometrists face in search of evidence-based information. The respondents provided suggestions on how EBP can be improved among Saudi Optometrist including: employer support to attend CE, journal subscription by the SAOVS for free access to registered members; and for Optometry schools to incorporate EBP courses in their existing curriculums. Further work is needed to investigate the proper ways of developing and nurturing optometry undergraduate and postgraduate students' skills and knowledge required for evidence-based practice. However, as evidence-based optometry practice becomes increasingly important in providing clinical guidance, the findings of this study would guide postgraduate and continuing education, and should serve as a mechanism for optometrists to promote life-long learning.

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Conflict of Interest

The authors declare no financial interest or any conflict of interest.

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