African Vision and Eye Health
ISSN: (Online) 2410-1516, (Print) 2413-3183

Patterns of prescribing contact lenses in Limpopo province, South Africa

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Dates:
Received: 28 May 2024
Accepted: 21 Jan. 2025
Published: 30 Apr. 2025

How to cite this article:
Madiga RMR, Netshirungulu RP, Maponya MA, et al. Patterns of prescribing contact lenses in Limpopo province, South Africa. Afr Vision Eye Health. 2025;84(1), a954. https://doi.org/10.4102/aveh.v84i1.954

Background: Contact lens (CL) prescribing is an essential strategy in vision correction. Patterns of CL prescribing are poorly reported globally, particularly in African countries irrespective of the high prevalence of uncorrected refractive error and corneal ectasia which can be corrected with CLs.

Aim: This study aimed to determine the patterns of CL prescribing, their determinants, barriers and enablers among private practice optometrists in Limpopo, South Africa.

Setting: Participants were optometrists from Limpopo province, South Africa.

Methods: The study used a quantitative, cross-sectional, survey design, and data on the prescribing patterns of CLs were obtained through a self-administered online survey distributed to private practice optometrists in Limpopo, South Africa.

Results: Ninety (43.0%) of optometrists completed the questionnaires from which 88 (94.9%) were Black African and had a mean age of 29.77 ± 7.21 years. While 74 (82.2%) participants reported to fit CLs, 48 (64.9%) participants reported to initiate conversations of CL wear to their patients. The mean self-reported knowledge and competencies score was good at 3.65 ± 0.71 using the Likert scale. Soft material (100%) and spherical designs (90.5%) were fitted the most by participants. Patient affordability (68.9%), poor patient motivation (52.7%) and poor lens tolerance (44.6%) were cited as the most common barriers to fitting CLs among participants who fitted CLs. The lack of equipment (62.5%), poor patient motivation (62.5%) and trial CL availability (37.5%) were the common barriers to CL fitting among participants who reported not fitting CLs.

Conclusion: Majority of participants were fitting soft spherical CL. Patient affordability together with a lack of motivation and a lack of equipment were the reported barriers to CL prescribing. It is essential to develop a comprehensive strategy aimed at encouraging practitioners to adopt CL use while simultaneously equipping them with the necessary skills and resources for effective CL fitting.

Keywords: contact lenses; prescribing patterns; Limpopo province; Optometrists; barriers to CL prescribing.

Introduction

Contact lenses (CLs) are medical devices made from polymer or silicone hydrogel materials, designed to be applied directly to the corneal surface of the eye for purposes such as vision correction, cosmesis or therapy.[1] By adhering to the tear fluid on the eye's surface, they move naturally with the wearer, providing a seamless visual experience.[2,3] Similar to spectacles, CLs refract and focus light to enable clear vision.[3] They are available in single vison or multifocal designs, with options for spherical or toric prescriptions, and come in a variety of wearing modalities and replacement schedules.[4] Contact lenses have the advantages of affording the wearer natural, unobstructed vision, increased peripheral vision and depth perception over traditional spectacles.[5] Contact lens wearers are less affected by glare, reflections, spatial distortion and environmental factors such as weather conditions, dust and perspiration common with spectacle lens wearers.[6,7] Advancements in technology have led to the development of CLs with transitional tint technology. These CLs adjust to changing light conditions and selectively filter certain wavelengths of light, enhancing colour perception. As a result, they are particularly beneficial for patients involved in sports, those with high refractive errors and individuals with colour vision deficiencies.[8]

Recent studies have highlighted the advent of CLs as a superior option for myopia control,[9] which refers to slowing the progression of near-sightedness in children and adolescents to reduce the

risk of complications such as retinal detachment or glaucoma. Specialised CLs, including orthokeratology and multifocal soft lenses, achieve this by altering peripheral defocus and limiting axial eye elongation.[10] Patients achieve vision correction during the day by using overnight orthokeratology CLs, which are effective for managing refractive errors, enhancing cosmetic appearance and for myopia control.[11] Corneal dystrophies, post-refractive surgeries, post-keratoplasty, ocular surface diseases and trauma may be best managed with CLs; and are used to relieve pain, promote healing of the cornea and as a system to deliver drugs to the eye to manage conditions.[12]

Irrespective of their benefits, CLs remain underutilised with only an estimated 140 million individuals globally wearing CLs with approximately 45 million in the United States (US).[12] While the number of individuals with refractive errors continues to rise, the rate of CLs adoption remains relatively low, showing little indication of substantial growth.[13,14] Studies from developing countries report similar trends, with some countries in Africa reporting as little as 1.1% of CL use and up to 96.7% of the study population not having any knowledge of CLs.[15] Besides the low rates of CL use reported, there is a limited number of studies on wearing CLs not only in the US,[16] but globally. The International Prescribing Survey, which reports on consecutive annual analysis of CL prescribing in various countries provides a baseline of global prescribing patterns. A total of 22 countries were included in the survey and the average age of patients fitted with CLs was 33.7 ± 15.9 years, of those, 65.0% were female, 39.0% were new fits and at least 87.0% were full-time wearers.[17] Of all fits worldwide, soft CL fits amounted to 86.0%, with 39.0% of daily disposables and 42.0% of reusables,[17] and extended wear lens fits were 6.0%.[17] Japan and Canada reported the highest number of fits while the Netherlands reported the highest number of rigid gas permeable (RGP) CL fits at 36.0%.[17]

Although the research is limited, South Africa shares similar results in CL fitting as seen in global trends. In the last decade, Noach et al.[18] and Khoza et al.[19] conducted studies based on the knowledge and attitudes towards CL fitting in South Africa. In the Gauteng province, Noach et al.[18] conducted a study on 171 soft CL wearers, of whom 63.0% were female and 37.0% were male. Among these wearers, 66.0% used monthly disposable CLs. The study involved 125 optometrists, who reported that only 45.0% of the patients they fitted were compliant.

In a study conducted in KwaZulu-Natal province, Khoza et al.[19] included 247 CL wearers and emphasised the need for better training and education on CL use, especially among adolescents.

Other studies of interest were based on keratoconus (KC) patient management. In the Limpopo province, only half of the KC patients attending public service facilities who require CL correction were fitted with CLs.[20,21] Whereas in the KwaZulu-Natal province, patients consulting at public facilities requiring CLs fitting were only managed with spectacles, and only later referred to private optometrists or the University of KwaZulu-Natal optometry clinic for CL fitting.[22]

The trends and disease patterns of conditions such as KC and progressive myopia necessitate CLs as a model management strategy. Studying the trends and patterns of CL fitting is crucial for understanding the factors that facilitate or hinder the process. To gather data on optometrists' prescribing patterns, we utilised a structured, self-administered online questionnaire to collect information on the determinants, enablers and barriers for prescribing CLs.

This study therefore aimed to determine the patterns of CL prescribing among private optometrists in Limpopo province, South Africa.

Research methods and design

Study design

A quantitative, descriptive, cross-sectional survey design was employed to collect data from practising optometrists in Limpopo province between August and October 2023. A structured, self-administered online questionnaire was used to collect data on the prescribing patterns of CLs among optometrists, as well as their determinants, enablers and barriers for prescribing CLs.

Setting

The study was conducted among private optometrists practising within Limpopo province, South Africa. These optometrists were practice owners, employed within independent or group practices in residential settings, malls, and shopping centres in rural, semi-urban and urban areas within the province.

Study population and recruitment

A total of 208 independent practising optometrists are registered with the Health Professions of South Africa (HPCSA) under Limpopo province (K. Maupye, personal communication, 06 November 2023). The link (https://forms.gle/eMCuZR2wZ2oWdS639) was distributed via email, mobile numbers and social media (WhatsApp) to optometrists with accessible contact details on internet platforms and optometrist networks. A snowball sampling was utilised whereby those with the link were also requested to distribute to other optometrists in their mailing list for wider reach. Eligibility was also based on current registration with the HPCSA and the ability to provide consent online.

Data collection

Development of the questionnaire

The questionnaire was developed based on a review of optometry and CL practice literature. It gathered demographic data, determined fitting frequency, commonly fitted CL types and assessed self-reported knowledge and skills

using a Likert scale. The questionnaire was created and administered using Google Forms, with responses captured in a Microsoft Excel spreadsheet.

Validation of the questionnaire

The questionnaire was created by five main authors and reviewed by three additional authors. The content validity of the questionnaire was confirmed by five optometrists who were either academicians or CL practitioners. A pilot study involving five participants was conducted, and their results were not included in the main study.

Reliability of the questionnaire

The reliability analysis of the Knowledge, Skills and Competencies (KSC) questions was conducted with the Cronbach's alpha value of 0.88 indicating the good reliability of the questions.

Statistical analysis

IBM Corporation Statistical Package for Social Sciences (SPSS), version 28.0. Armonk, New York was used for data analysis. Data were summarised as frequencies, means, standard deviation (s.d.), and presented in the form of figures and tables. Mean scores were calculated for responses to KSC questions with scores between 1.0 and 1.8 indicating poor knowledge, between 1.9 to 2.6 indicating fair knowledge, 2.7 to 3.4 indicating average knowledge, 3.5 to 4.2 indicating good knowledge and 4.3 to 5.0 indicating excellent knowledge. To determine existing relationships between variables, bivariate analysis was conducted with confidence set at 95% and 5% level of significance ($p = 0.05$).

Ethical considerations

This study acquired ethical approval from the Turfloop Research Ethics Committee with the TREC clearance TREC/485/2023: UG. Participants were asked to choose 'yes' or 'no' to consent to participation. Selecting 'yes' granted access to the complete questionnaire, while choosing 'no' redirected participants to the end of the questionnaire. Participation was voluntary, and participants were informed of their right to withdraw at any time before completing the questionnaire. No participants' information was collected to ensure confidentiality.

Results

The survey achieved a response rate of 43.0%, with 90 optometrists participating. Among the participants, 53.3% were males and 46.7% were females, and the average age was 30 years (29.7 ± 7.5). There was no significant age difference between male and female participants (P = 0.081). The majority (94.4%) of the participants were black Africans, with 0.2% being Caucasian and 0.2% Indian. On average, participants had been in practice for 6.67 ± 7.20 years. In addition, 28.6% had postgraduate qualifications, including 1.1% with doctoral degrees, 11.1% with master's degrees, 5.5% with postgraduate diplomas and 4.4% with postgraduate certificates. Only 8.9% of participants reported having received postgraduate training in CL fitting.

Rate of contact lens fitting

A total of 82.2% participants fitted their patients with CLs and other results are presented in Figure 1.

Out of 90 participants, 44.5% practised in urban areas, 32.2% in semi-urban areas and 23.3% in rural areas. There was a significant difference in whether optometrists fitted CL based on the area of their practice ($p = 0.039$). More than half of the participants (57.8%) had independent private practices, 21.1% had practices in medical centres, 16.7% in franchised practices and 4.4% had practices in other settings. Majority (64.9%) of the participants reported that they usually initiate the option of CLs to patients, 32.4% reported that their patients would initiate the need for CL and 2.7% were existing CL wearers who prefer to continue wearing them.

Thirty-eight per cent of the participants had their practices set up in a shopping complex, 22.0% in a mall, 16.0% in other locations and 14.0% in a residential area. There was no significant difference ($p = 0.086$) in the patterns of CL fitting based on the location of the practice in terms of business area.

Characteristics of the patients fitted with contact lens

As evident from Table 1, 96.0% of the participants reported fitting mostly female patients. In addition, 89.2% commonly fitted patients aged 21 to 40 years, while only 9.5% commonly fitted patients aged 20 years or younger.

Frequency of fitting contact lens

Table 1 shows that 41.9% of the participants fitted CL every 3 weeks to a month, and 63.3% commonly fitted CL for 1 out of every 10 patients visiting their practices.

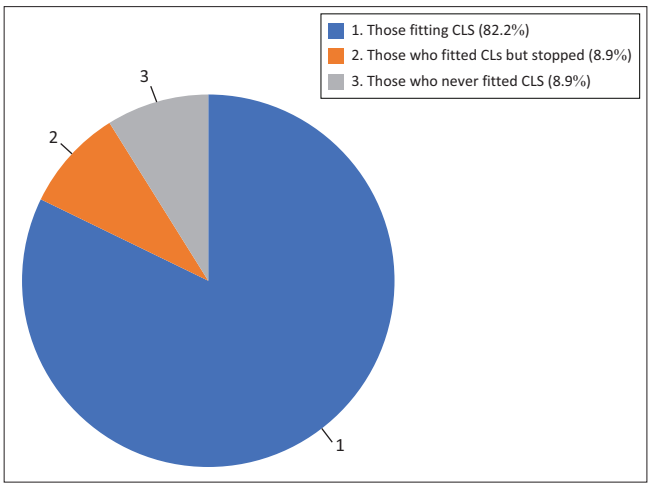

FIGURE 1: Contact lens fitting patterns among optometrists.

Type of contact lens commonly fitted

As indicated in Table 2, 82.0% of the participants utilised soft CLs, with 90.5% using a spherical CL design and 43.2% using a toric CL design. Moreover, 87.8% of the participants used reusable monthly disposable CL, with 55.4% prescribed for daily wear.

Common conditions managed by contact lens

Figure 2 shows that near-sightedness (myopia) (85.1%) and astigmatism (46.3%) were the most common conditions for which CLs were fitted for. Approximately 55.4% of participants were commonly fitted with CL for cosmetic purposes. In addition, 16.2% and 14.9% of participants were fitted with CL to manage presbyopia and keratoconus, respectively.

Instructional tools, and continuous professional development

More than half of the participants (52.2%) used audio and videos to support their understanding of CL fitting, while 48.9% used these resources to train their patients during trial fitting. While 48 participants attended continuous professional development (CPD) on CLs at least once a year, 17.8% and 7.8% attended CPD sessions at least once in 2 years and once in 5 years, respectively. Furthermore, 23 (25.6%) participants reported never attending a CPD activity for CL.

Regarding reading habits, 35 (38.9%) participants read literature on CLs at least once in 6 months, 33.3% at least once a month, 2.2% at least once a week, and 23 (25.6%) participants reported never reading literature on CLs.

Knowledge and competencies

Figure 3 illustrates that the mean scores for self-reported knowledge and competencies were rated at 3.65 ± 0.71. Soft CL fitting competencies were rated at 4.4, RGP CL fitting at 3.5 and scleral CL fitting at 3.1.

Available resources

Table 3 reveals the availability of resources, with slit lamp biomicroscopy reported to be available in practices by 84.4% of participants, followed by the keratometer

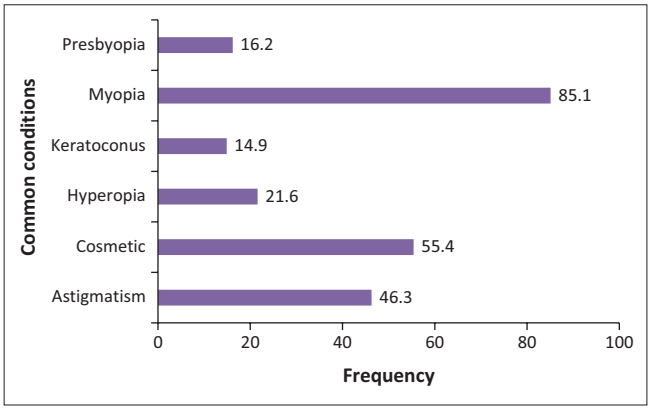

FIGURE 2: Common conditions that contact lenses were prescribed for.

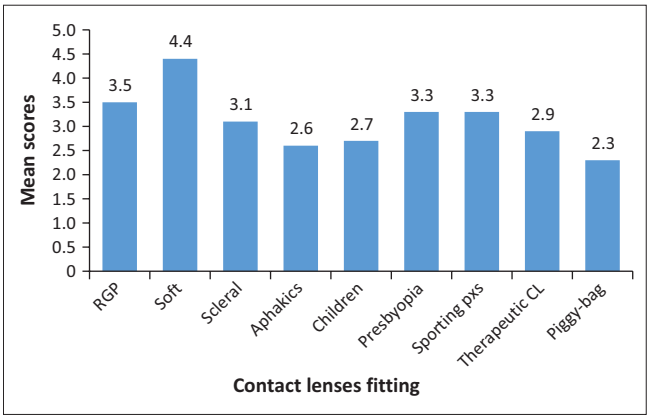

FIGURE 3: Practitioner self-reported knowledge and competencies in contact lens fitting.

TABLE 1: Parity on age and gender of patients fitted and frequency of fitting.

Commonly fitted patients per gender*			Commonly fitted patients per age category*			Participants' frequency of fitting per the time frame*			The ratio of patients fitted with CLs to seen*			Who initiates CL as an option for vision correction*		
Gender	***n***	**%**	**Age category**	***n***	**%**	**Frequency**	***n***	**%**	**Ratio**	***n***	**%**	**Frequency**	***n***	**%**
Male	3	4.1	20 years or less	7	9.5	1 patient per week	22	29.7	1:2	10	11.1	Practitioner initiates	48	64.9
Female	71	95.9	21 to 40 years	66	89.2	1 patient in 2 weeks	21	28.4	1:5	7	7.8	Patient initiates	24	32.4
-	-	-	41 to 60 years	1	1.4	1 patient in 3 weeks	15	20.3	1:10	57	63.3	Existing CL patient	2	2.7
-	-	-	-	-	-	1 patient per month	16	21.6	-	-	-	-	-	-

CL, contact lens.
*, $P < 0.001$.

TABLE 2: Contact lens materials and designs commonly fitted.

CL material	*n*	%	CL design	*n*	%	Wear modalities	*n*	%	Replacement schedules	*n*	%
Soft	74	100	Spherical	67	90.5	Daily wear	41	55.4	Monthly disposable	65	87.8
Scleral	8	10.8	Toric	32	43.2	Flexible wear	13	17.9	Daily disposable	6	8.1
RGP	6	8.1	Multifocal	13	17.6	Continuous wear	12	16.2	Conventional	3	4.1
-	-	-	Toric-Multifocal	4	-	Extended wear	8	10.8	-	-	-

CL, contact lens; RGP, rigid gas permeable.

TABLE 3: Equipment available and trial contact lens and consumables kept by participants.

Available equipment	*n*	%	Trial CL	*n*	%	Consumables	*n*	%
Refraction unit	78	86.7	Scleral	8	8.9	Fluorescein strips	63	79.7
Vertometer	39	43.3	Soft	78	86.7	Schirmer strips	47	59.5
Corneal topographer or pachymeter	11	12.2	RGP	26	29.0	CL Solutions	77	97.5
OCT	9	10.0	-	-	-	-	-	-
Slit lamp biomicroscopy	76	84.4	-	-	-	-	-	-
Keratometer	54	60.0	-	-	-	-	-	-

CL, contact lens; OCT, ocular coherence topographer; RGP, rigid gas permeable.

TABLE 4: Barriers to contact lens fitting.

Barriers and/or challenges to CL fitting	Those fitting CLs		Those not fitting CLs	
	n	%	*n*	%
Lack of equipment	12	16.2	10	62.5
Poor patient motivation	39	52.7	6	37.5
Patient affordability	51	68.9	4	25.0
Poor lens tolerance	33	44.6	-	
Availability of trial CL	7	9.5	6	37.5
Lack of consumables	3	4.1	-	-
Other	7	9.5	-	-

CL, contact lens.

(60.0%). In addition, 86.7% of participants reported having refraction units, and other resources such as a vertometer, corneal topographer or pachymeter, and ocular coherence tomographer (OCT) were also available to varying degrees. Of all the participants who were fitted with CLs, 98.5% kept soft CL trials, 29.0% kept RGP diagnostic fitting sets and only 10.1% kept scleral diagnostic fitting sets.

Barriers to contact lens fitting

Table 4 displays barriers to CL fitting, with patient affordability (68.9%), poor patient motivation (52.7%) and poor lens tolerance (44.6%) cited as common barriers by participants who were fitted with CL. For those who were not fit CL, the lack of equipment (62.5%), poor patient motivation (37.5%) and the availability of trial CLs were reported as barriers to CL fitting.

Furthermore, 18.9% of participants referred their patients to another practitioner for CL fitting, while 2.7% prescribed spectacles for their patients. Some participants reported that they would consider the possibility of fitting CL (11.1%) or consider fitting them in the future (6.7%). In addition, 10.0% of participants reported considering fitting CLs depending on the acquisition of relevant equipment, 6.7% would consider depending on market demand and 1.1% would consider after improving their fitting skill set.

Discussion

The study describes the prescribing patterns of CLs by optometrists in Limpopo province, South Africa. The sample population in the study represented the general population in the province in terms of ethnicity (Statistics South Africa [StatsSA],[23] July 07, 2016). It was found that 17.8% of optometrists reported not fitting CLs in their practice. This presents a significant challenge as it may mean that patients are not being presented with CLs as an option for their vision correction. According to the American Optometry Association,[24] optometrists miss opportunities to present CLs as an option for vision correction in at least two out of three patients. All practising optometrists in South Africa need to consider CL fitting as essential for patient management within their scope of practice.[25]

The study participants reported that females and patients between the ages of 21 and 40 years were commonly fitted with CLs, which is consistent with various other studies.[26,27,28] In addition, it was observed that more females than males were fitted with CLs, and women tended to be more compliant with follow-up appointments and switching to newer, healthier CL options.[29] In terms of age, the study found that patients aged around 26 years were commonly fitted with CL. This trend is consistent with findings from other parts of the world, such as Australia, Canada, Europe and the US, where females and younger patients also showed a higher preference for CL wear.[27] However, an international survey reported that the average age of patients fitted with CLs was higher at 34 years.[30] This study suggests that patients in this age category may have greater purchasing power for CLs and their maintenance because of being employed.

The majority of participants reported fitting soft CLs, with a smaller percentage fitting scleral lenses (10.8%) and RGP CLs (8.1%). Various studies support these findings and are consistent with the global trends in soft CL prescribing.[26,27,28,29] This preference is attributed to the immediate comfort and easy adaptation[31] of soft CL, making them ideal for occasional wears. Advancements in technology have enhanced the design and materials of soft CLs, making them a more favourable choice over RGP CLs.[27] Patients favour soft CLs with high oxygen permeability, comparable to or better than RGP CLs.[32] However, there is a concern about the low proportion of participants fitting scleral and RGP CLs,[20] particularly given the increasing prevalence of conditions such as keratoconus, especially in this province. There is an urgent need to increase the number of optometrists capable of prescribing scleral and RGP CLs. Skill development of optometrists and equipment mobilisation[21] are crucial strategies for improving the rate of RGP CL fitting.

The survey's findings indicate that 87.8% of the participants commonly prescribe reusable CLs, with 55.4% prescribing daily wear CLs. These results are lower than the 91.8% reported for daily wear CLs in Nigeria.[26] The socio-economic status of the patients is an important consideration, as reusable CLs are seen as cost-effective. Approximately 41.9% of practitioners fit CLs once every 3 weeks to a month and 63.3% fit CL for 1 out of every 10 patients they see. This suggests that CL fitting may not be a primary practice among this group of practitioners. Although 64.9% of participants

initiate CLs for their patients, this doesn't align with the number of patients ultimately being fitted with CLs. Mayers et al.[33] found that providing complementary CLs during the spectacle selection process may improve patient uptake. It is suggested that patients be introduced to readily available and free trial CLs during consultations to incite their interest. Furthermore, practitioners must develop strategies to retain patients in CL programmes and reduce the dropout rate. Mayers et al.[33] believe that the overall number of CL wearers remains constant because of the annual drop-out rate caused by issues such as lens discomfort and insufficient vision correction provided by CL.

The findings of this study align with those of Morgan et al.,[29] who reported a 66.0% rate of reusable CL usage. Several studies have highlighted the use of CLs for correcting myopic refractive errors.[2,34] In this study, optometrists prescribed CL for myopia correction at a higher rate of 85.1%. However, the proportion of practitioners prescribing CLs for presbyopia (16.2%) and keratoconus (14.9%) was significantly lower. While presbyopic patients can often be effectively managed with spectacles,[2] keratoconus is more challenging to correct with spectacles because of the irregularity of the cornea. The increasing prevalence of KC and other ectatic corneal conditions has made the use of CLs, especially RGP and scleral CLs, necessary to provide a smoother and more normal optical surface for the irregular keratoconic cornea.[35] Patients with moderate to advanced KC commonly rely on RGP and scleral CLs because of the limitations of spectacles in providing the necessary correction.[36] There is, therefore, a greater need for every optometrist to specifically fit CLs to manage KC patients, either by fitting them, providing aftercare, or both. Although some optometrists may lack the confidence or the resources to fit these CLs on patients, they should still be able to provide patient support after the fitting.

The study found that just over half of the participants (55.4%) fitted cosmetic CLs in their practice, showing significant potential for business growth with these lenses.[21] Practitioners should recognise this opportunity to increase their profitability.

In addition, 52.2% of the participants used technology such as videos and audio to improve their knowledge and understanding of CLs, while 48.9% used the technology to educate their patients. There is overwhelming support for the use of audio and video tools to suggest their effectiveness in patient education. According to Chan and Chen,[37] there was a higher viewer rate of CL insertion and removal videos uploaded on YouTube irrespective of the quality of these videos. Videos uploaded by CL companies were highly rated for content and quality.[37]

The mean scores of participants on KSC scale for CL fitting were good (3.65 ± 0.71) and while the KSC for soft CL fitting was self-rated to be excellent (4.4). However, the mean scores for RGP (3.5) and scleral (3.1) CL fitting were average to good, although the percentage of those who commonly fitted these CLs was still lower at 10.8% and 8.5%, respectively. The frequency of CL fitting which in this study was rare, about once every 3 weeks to a month, may influence the confidence of participants in the KSC.

The study also found that more than two-thirds of the participants reported patient affordability (68.9%) as the barrier for CL wear, while about half of their patients were poorly motivated to wear CLs (52.7%) and had poor lens tolerance (44.6%). Other reported barriers to CL wear included a lack of awareness of CL wear by patients, the lack of equipment, poor patient motivation and availability of trial CLs, which aligned with another study conducted by Thite et al.[38] in India.

This study aimed to describe the patterns of prescribing CLs, barriers to fitting and optometrists' self-reported knowledge of fitting CLs among South African optometrists. The findings reported in this study may not be generalised for all optometrists in South Africa, as only optometrists in the Limpopo province were sampled for the study.

Conclusion

The majority of the participants were optometrists working in independent private practices located in urban shopping complexes. Significant differences were found in the fitting of CLs based on practice setting, location and type of practice. Most practitioners fitted soft CLs, while a few fitted RGP and scleral CLs. Myopia and astigmatism were common conditions for which practitioners reported fitting CLs, and some also reported fitting cosmetic CLs. Practitioners had a mean KSC score of 3.65 ± 0.75, which was considered 'good'. Commonly reported barriers to CL fitting included patient's lack of affordability of CLs, poor motivation to use CLs, practitioners' lack of equipment for CL fitting and poor lens tolerance.

Acknowledgements

This article is partially based on the author's thesis entitled 'Prescribing patterns of contact lenses among optometrists in Limpopo Province of South Africa' towards the degree of Bachelor Optometry in the Department of Optometry, University of Limpopo, South Africa, 2023, with supervisor P.M.W. Nkoana and co-supervisors N. Shabalala and V.N. Sukati.

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

R.M.R.M., R.P.N., M.A.M., E.M. and A.M. contributed towards the conceptualisation and methodology. V.N.S.

contributed to the conceptualisation, methodology, writing, review and editing. N.S. contributed to the conceptualisation, methodology, co-supervision, writing of the original draft, review and editing. P.M.W.N. contributed towards the conceptualisation, methodology, supervision, writing of the original draft, formal analysis, review and editing.

Funding information

This research work received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Data availability

Data used to support the findings of the study are available from N.S., the corresponding author, upon request.

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