



Statistical Study on the Use of Contact Lenses in Greece

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Authors' contributions

This work was carried out in collaboration among all authors. Author EP designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors MM and JG performed the statistical analysis, managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Purpose: This study was conducted in order to examine the behavior of contact lenses users, the type of contact lenses they use, their satisfaction with their contact lenses after evaluation by the users themselves, both in the quality of vision and in the comfort they offer.

Material and Methods: A questionnaire in printed form was used to conduct the research, which was distributed to optical stores in Glyfada, Maroussi (suburbs of Athens) and the city of Kalamata province in Peloponnese. An online questionnaire was created for the e-shops of the collaborating optical stores, which was completed by internet users. The sample was 380 people, users of contact lenses, and their age ranged from 18 to 55 years old. The study was conducted in six months from January 2019 to June 2019.

Results: The material of the contact lenses preferred by the users are the silicone-hydrogel lenses (71.05%), the monthly use is prevalence (74.74%) the days of use are 7 days per week (59.74%) while the hours of use that appear more frequently are 8 to 12 hours per day (42.11%). The main reason for the use of contact lenses is the external appearance (48.16%). 88.4% of the population considers the insertion and removal of lenses an easy process as well as the comfort offered by the lenses during application was evaluated positively in the largest sample (42.37%). The signs that

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seem to encourage users to replace their lenses is not the time of use but mainly sensation of dry eyes (29.21%), intolerance (22.11%) and blurred vision (20.26%). The quality of vision with CLs is Very good to Good at a percentage of 94.74%, while only 12.89% sleep with their lenses.

Conclusions: There is a need to further investigate the performance of contact lenses, from the side of wearers, both in the global scientific community and in Greece, as the scientific literature on this issue needs continuous updating. The majority prefers and wears soft CLs, silicone-hydrogel especially, and the satisfaction percentage is high. The usage of CLs during sleep is a big concern for the professional CL fitters as 1 of 10 users use them.

Keywords: *Contact lenses; silicon hydrogel; wearers satisfaction; replacement scheme; sleeping with CLs; vision quality.*

1. INTRODUCTION

The use of contact lenses has become a daily habit for a large percentage of people. Their main function is to correct refractive errors that cause ametropia. Optical and physical properties of contact lens materials are important factors for selection of fit. Oxygen permeability (Dk) is an important factor for user hygiene [1-3]. Most important for corneal integrity is Oxygen transmissibility (Dk/t) value for each particular lens. [1-3]. Contact lenses are divided into two main categories, in this study “soft”, hydrophilic CLs including silicon hydrogel which are made flexible from high-water-content material or “hard” rigid gas-permeable lenses which are durable [1-3].

The use of contact lenses is now very widespread around the world. The distribution of contact lens types in terms of material preferred, time of use, user behavior, and user satisfaction with their contact lenses varies from country to country, depending on user demographics, availability of all types of contact lenses, the average income of users, knowledge in fitting of professionals, and other cultural factors [4-13]. The study of international trends in the use of contact lenses and the new products available in the market of each country allows professional practitioners to modify their own contact lens fitting practices in relation to other professionals from around the world.

The data on the preferences, trends of contact lenses in fitting and use of contact lenses are for the information of contact lens manufacturers mainly. Philip Morgan, Nathan Efron et al. [14-17] have tried in collaboration with manufacturing companies to have systematically studied the trends of contact lenses internationally over the last 15 years.

Globally, refractive errors are increasing every year, so there is a need for constant monitoring.

Contact lenses (CLs) have been used for more than 50 years for the correction of refractive errors, for cosmetic purposes and as a therapeutic way for corneal pathologies, or after surgery. So, the use of CLs has increased significantly and a continuous increase is expected.

CLs remain a safe and effective way for refractive errors correction, but there must be a continuous hygiene care of users as recommended. However, some CLs users may develop ocular infections if they do not wear, clean, disinfect, or store CLs as instructed by experts.

Continuous epidemiological studies are therefore required to provide ongoing information on the rate of use of CL, the type of CL and behavior of users as well as the complications that may occur.

This study was conducted without the involvement of any manufacturer of contact lenses to determine the type of contact lens use, reasons, hygiene practices and satisfaction associated with the use of CLs

2. MATERIALS AND METHODS

There are a lot of studies about the trends of different kind of contact lenses [4-10]. This is a study aimed at a random, anonymous population of contact lens users of all types, lasting for six months. The study was conducted through a questionnaire consisting of 25 open-ended and closed-ended questions, complementary to the research. The first part of the questionnaire consists of general open-ended questions, personal information, while in the second part the questions are multiple choice, about contact lenses, comfort, quality and health of users. For this study, the users of contact lenses that participate wear of all types of contact lenses

from different brands, forming a sample of 380 people.

Answering the questionnaire did not have to do with what material or brand of contact lenses they use, also regardless of their age, and they should not have any major eye problems. The questionnaires were distributed in optical stores of Glyfada, Maroussi and Kalamata. An online questionnaire was also created through the e-shop platform of the optical stores, for internet distribution.

3. RESULTS AND DISCUSSION

In the second stage of the research, the results were collected and presented in the form of a pie or bar chart.

Questionnaire was consisted of 25 questions and the results of the survey for each question are presented below in a form of a table, showing the participants and the percentage they represent.

Table 1. What is your gender?

	Participants	Frequency Percentage (%)
Male	116	30,53%
Woman	264	69,47%
Total	380	100,00%

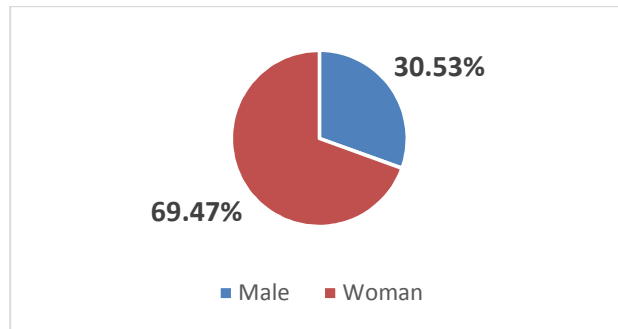


Fig. 1. Gender

Table 2. What is your age?

	Participants	Frequency Percentage (%)
18-20	25	6,60%
20-29	248	65,30%
30-39	76	20,00%
40-49	18	4,70%
50-55	13	3,40%
Total	380	100,00%

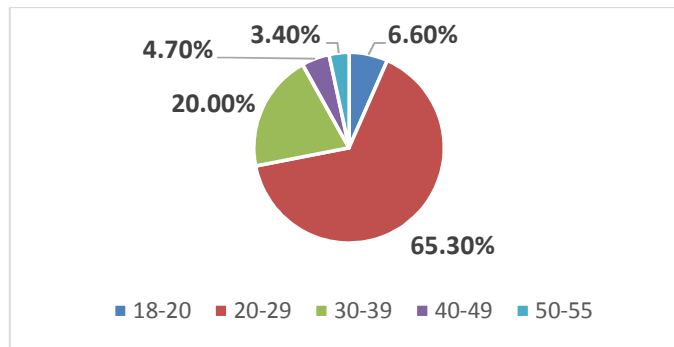


Fig. 2. Age group

Table 3. What is your level of education?

	Participants	Frequency Percentage (%)
Primary education	1	0,26%
Secondary education	123	32,37%
University graduate	214	56,32%
Master's or doctoral degree	42	11,05%

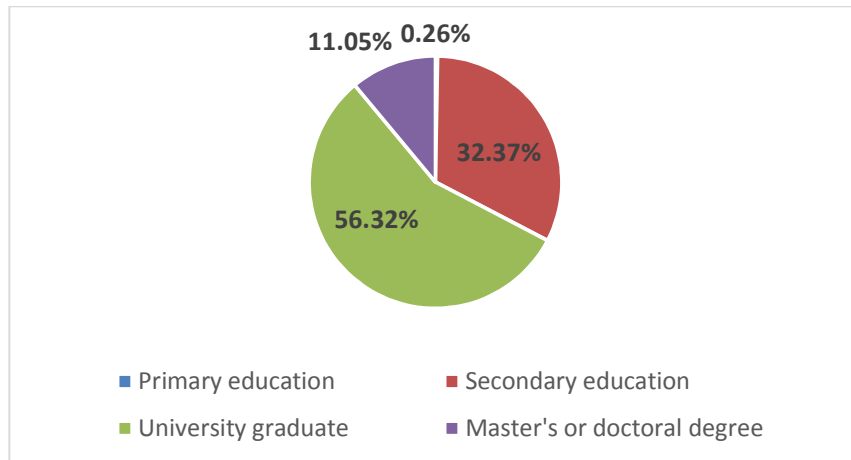


Fig. 3. Level of education

Table 4. How did you first learn about contact lenses?

	Participants	Frequency Percentage (%)
Newsletter - Advertising brochure	0	0,00%
Friends or relatives	153	40,26%
Optician-Optometrist	118	31,05%
Ophthalmologist	90	23,68%
Internet	8	2,11%
Other	11	2,89%

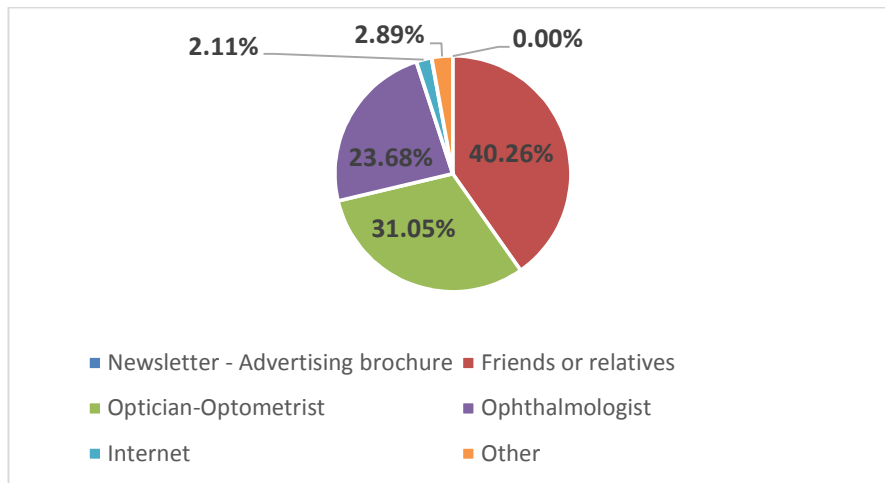


Fig. 4. How did you first learn about contact lenses?

Table 5. What type of contact lenses do you wear?

	Participants	Frequency Percentage (%)
Hard - RGP	8	2,11%
Soft	372	97,89%

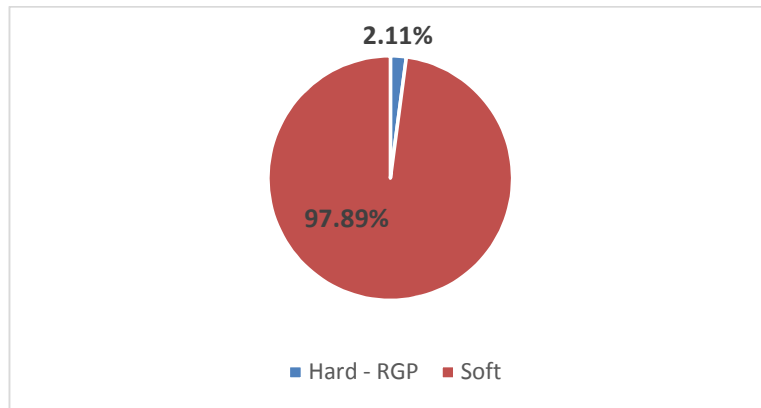


Fig. 5. What type of contact lenses do you wear?

Table 6. If you wear soft contact lenses, please specify your preference

	Participants	Frequency Percentage (%)
Hydrogel	102	26,84%
Silicon Hydrogel	270	71,05%

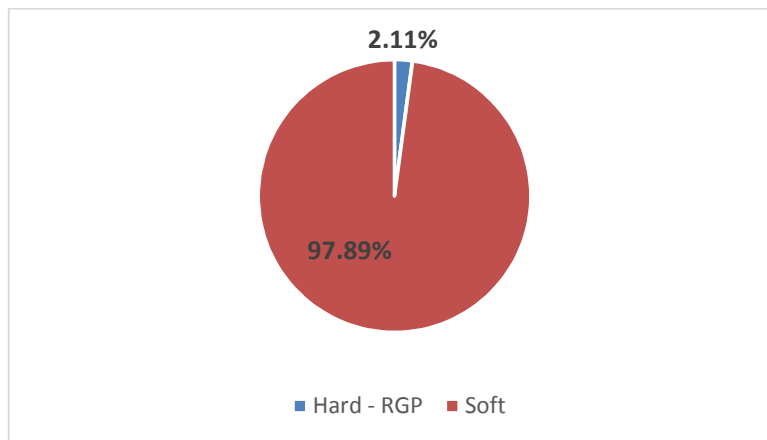


Fig. 6. What type of contact lenses do you wear?

Table 7. If you wear soft contact lenses, how often do you replace them?

	Participants	Frequency Percentage (%)
Daily	35	9,21%
Monthly	284	74,74%
15 days	17	4,47%
3 months	35	9,21%
Annual	6	1,58%
Other	3	0,79%

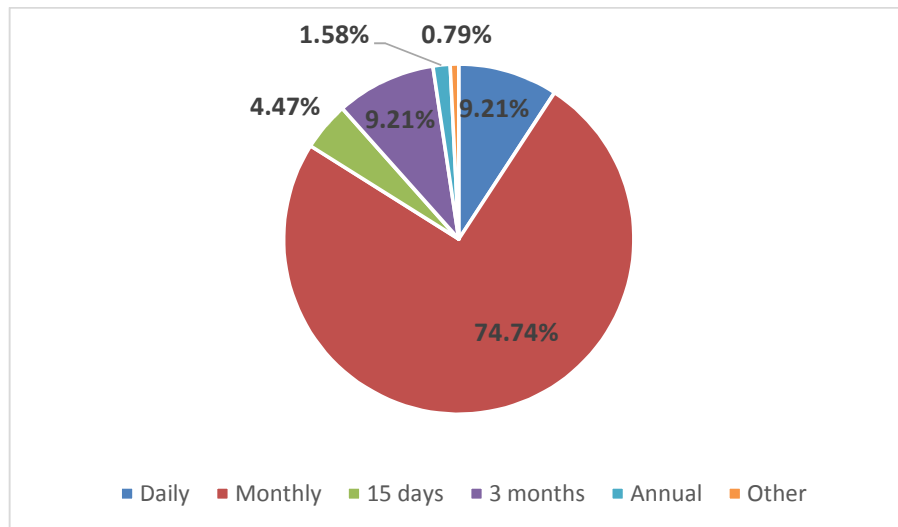


Fig. 7. Replacement scheme

Table 8. How many hours a day, on average, do you wear contact lenses?

	Participants	Frequency Percentage (%)
1 to 4	37	9,74%
4 to 8	99	26,05%
8 to 12	160	42,11%
12+	84	22,11%

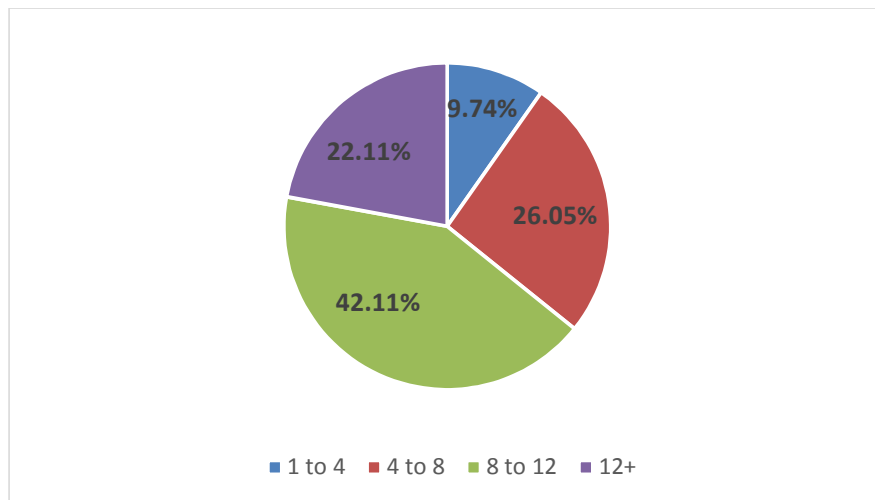


Fig. 8. Hours of usage

Table 9. How many times a week, on average, do you wear contact lenses?

	Participants	Frequency Percentage (%)
Daily	227	59,74%
3 to 5	97	25,53%
1 to 2	56	14,74%

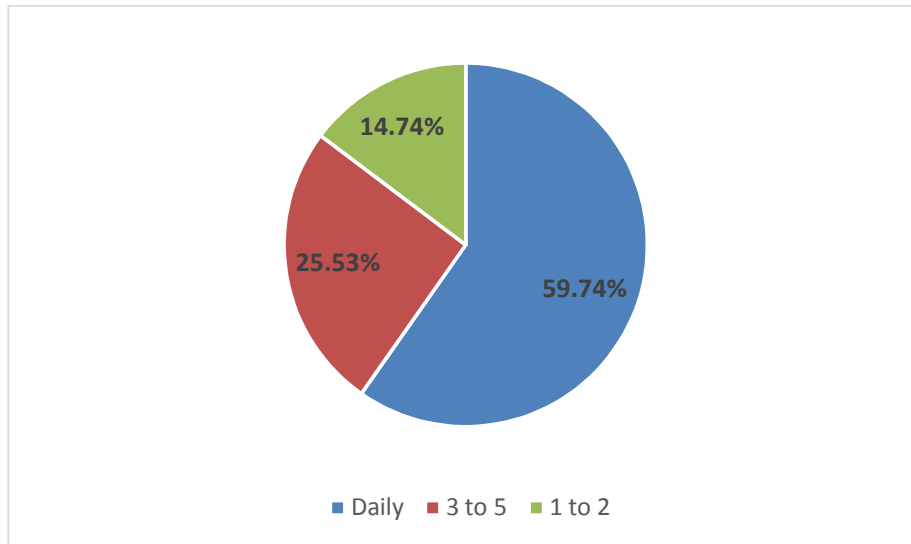


Fig. 9. Average usage per week

Table 10. What is the reason that you wear contact lenses?

	Participants	Frequency Percentage (%)
Cosmetics	183	48,16%
Sports	27	7,11%
Facility in the workplace	130	34,21%
Other	40	10,53%

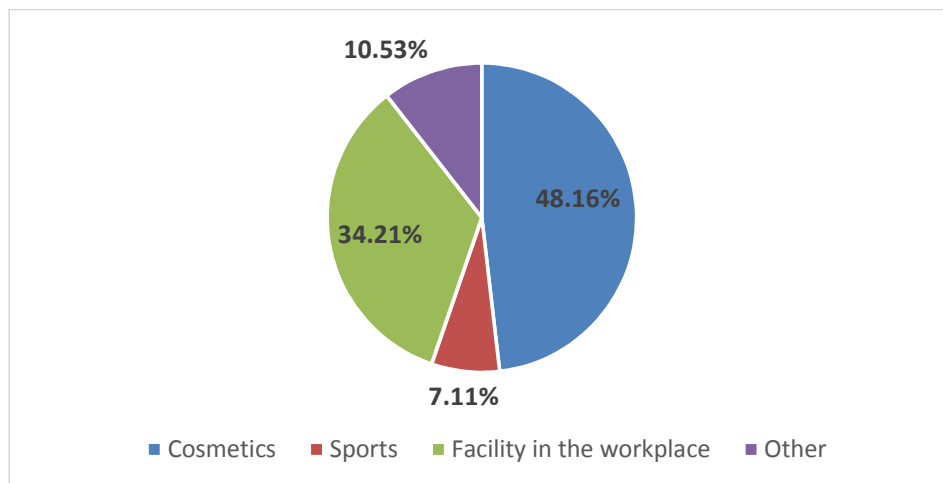


Fig. 10. Reason of wearing CLs

Table 11. Do you follow the rules of hygiene and proper use of contact lenses?

	Participants	Frequency Percentage (%)
Yes	323	85,00%
No	36	9,47%
I do not know	21	5,53%

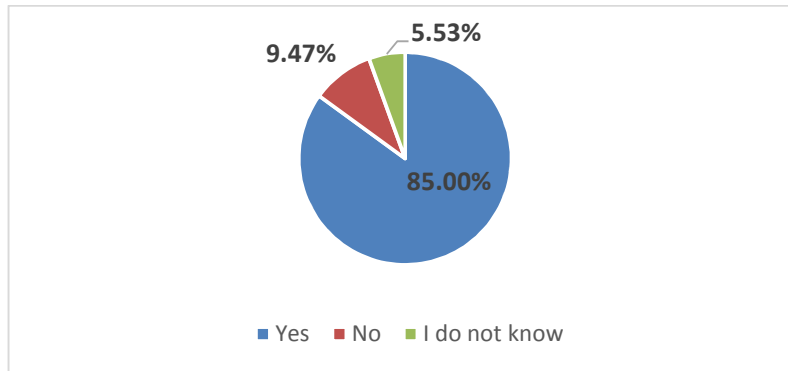


Fig. 11. Follow the rules of hygiene and proper use

Table 12. Did the Optician-Optometrist give you the correct instructions for use for cleaning and storing contact lenses?

	Participants	Frequency Percentage (%)
Yes	349	91,84%
No	31	8,16%

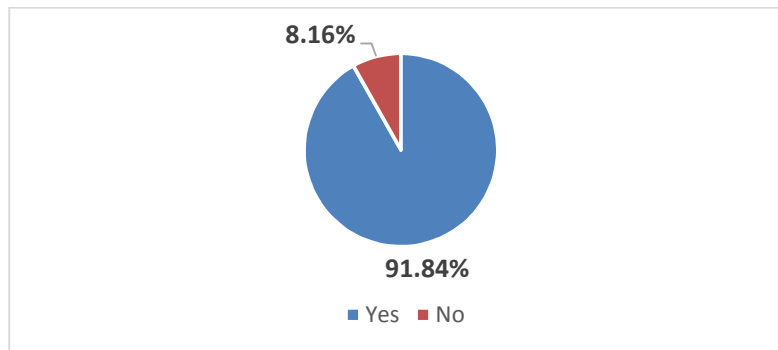


Fig. 12. Did you got the correct instructions for use for cleaning and storing contact lenses

Table 13. Is the process of their fitting and removal difficult?

	Participants	Frequency Percentage (%)
Yes	336	88,42%
No	44	11,58%

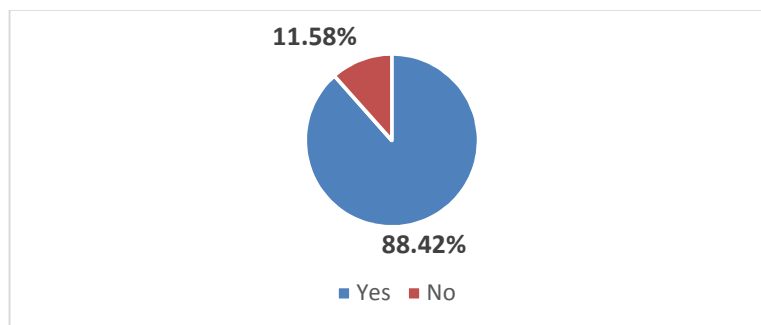


Fig. 13. Is the process of their fitting and removal difficult

Table 14. Are they comfortable for you?

	Participants	Frequency Percentage (%)
Absolutely	161	42,37%
Enough	175	46,05%
Moderate	37	9,74%
A little	3	0,79%
Not at all	4	1,05%

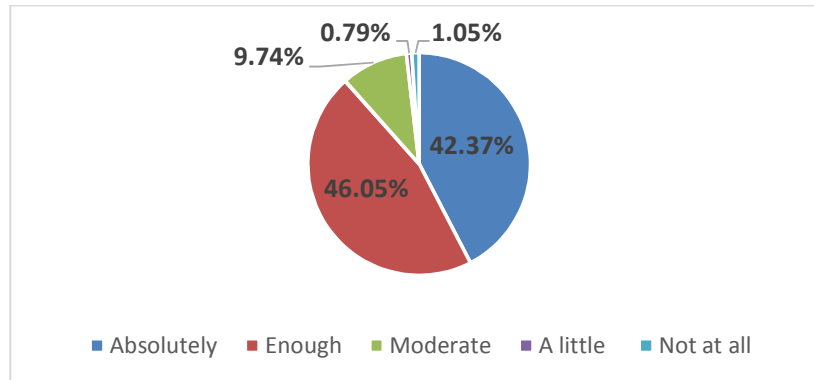


Fig. 14. Are they comfortable for you

Table 15. Are you satisfied with your contact lenses?

	Participants	Frequency Percentage (%)
Absolutely	153	40,26%
Enough	183	48,16%
Moderate	38	10,00%
A little bit	5	1,32%
Not at all	1	0,26%

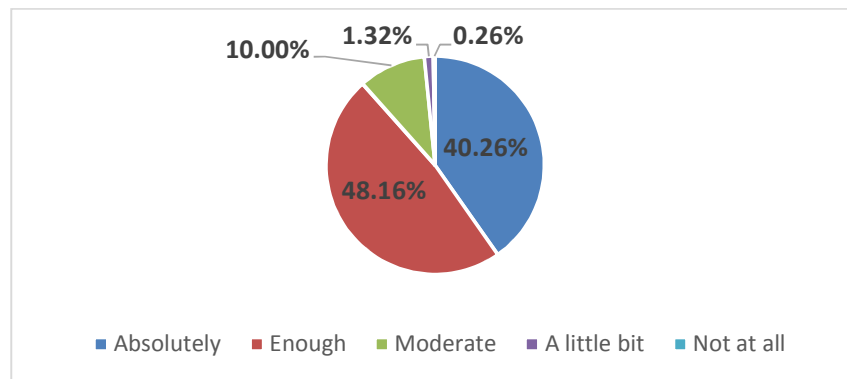


Fig. 15. Are you satisfied with your contact lenses

Table 16. How do you judge the quality of your vision with CLs?

	Participants	Frequency Percentage (%)
Very good	201	52,89%
Good	159	41,84%
Moderate	20	5,26%
Poor	0	0,00%

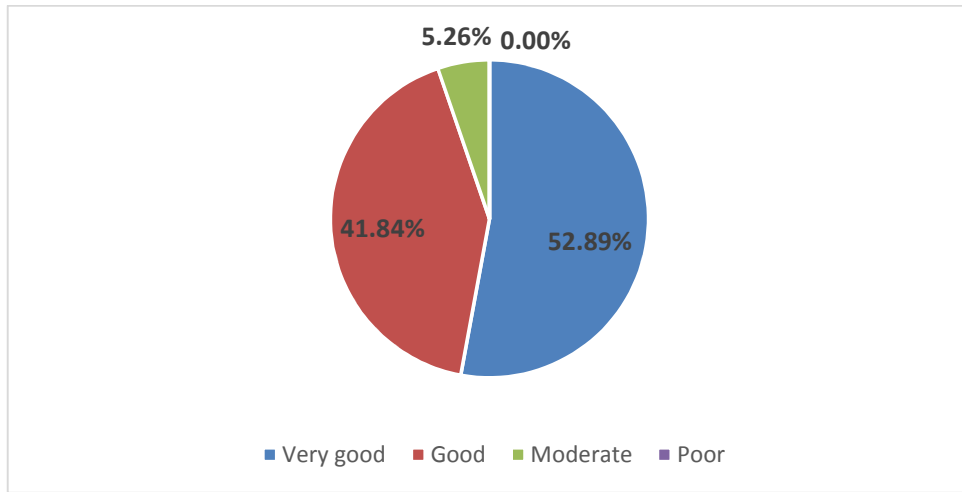


Fig. 16. How do you judge the quality of your vision with CLs

Table 17. Do you comply the proposed duration of use of contact lenses?

	Participants	Frequency Percentage (%)
Yes	200	52,63%
No, I replace them sooner	18	4,74%
No, I replace them later	162	42,63%

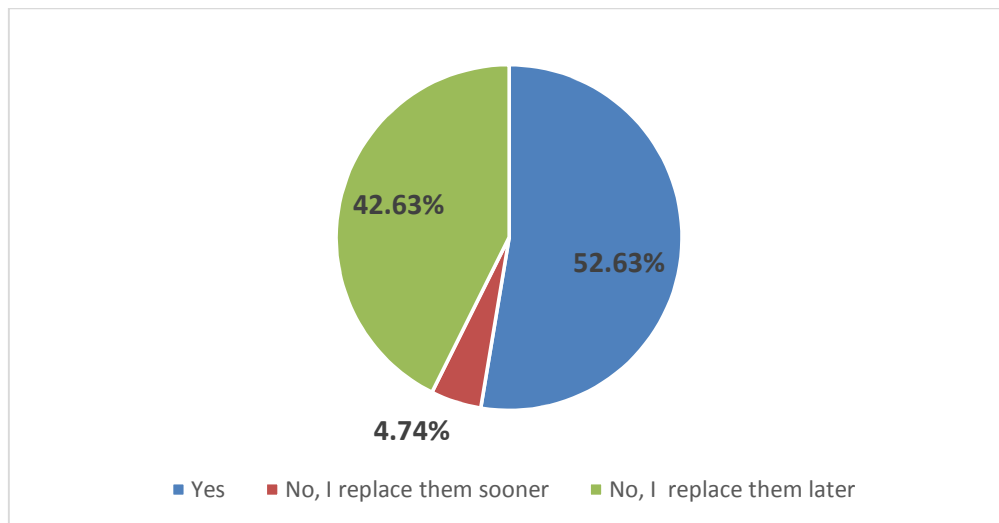


Fig. 17. Do you comply the proposed duration of use of contact lenses

Table 18. What prompts you to replace them?

	Participants	Frequency Percentage (%)
Intolerance	84	22,11%
Blurred vision	77	20,26%
Dry eye	111	29,21%
Nothing	108	28,42%

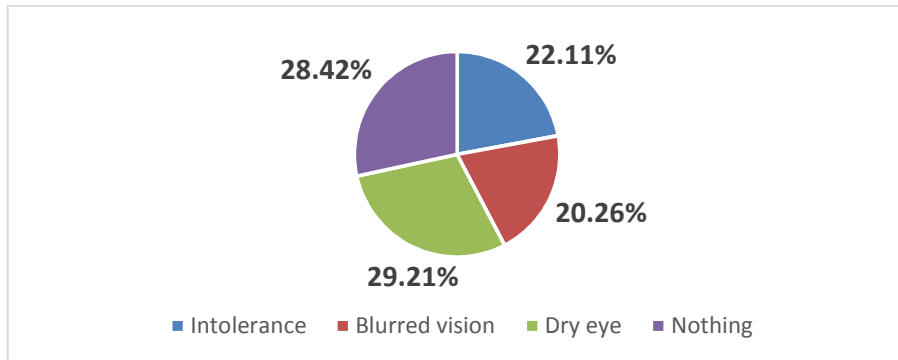


Fig. 18. What prompts you to replace them

Table 19. How do you judge information given about contact lens?

	Participants	Frequency Percentage (%)
Very good	157	41,32%
Good	159	41,84%
Moderate	57	15,00%
Poor	7	1,84%

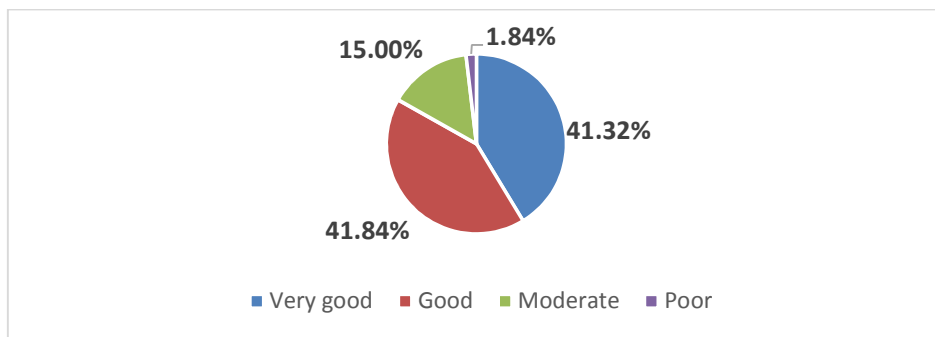


Fig. 19. How do you judge information given about contact lens

Table 20. Do you sleep with your contact lenses?

	Participants	Frequency Percentage (%)
Yes	49	12,89%
No	331	87,11%

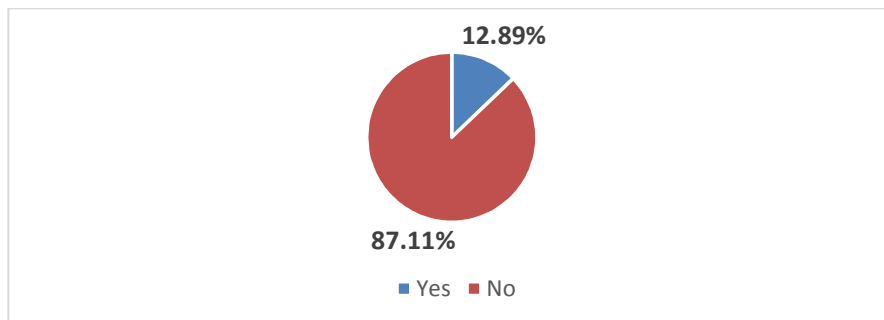


Fig. 20. Do you sleep with your contact lenses

Table 21. Would you try a different type of contact lens than the one you are already using?

	Participants	Frequency Percentage (%)
Yes	269	70,79%
No	111	29,21%

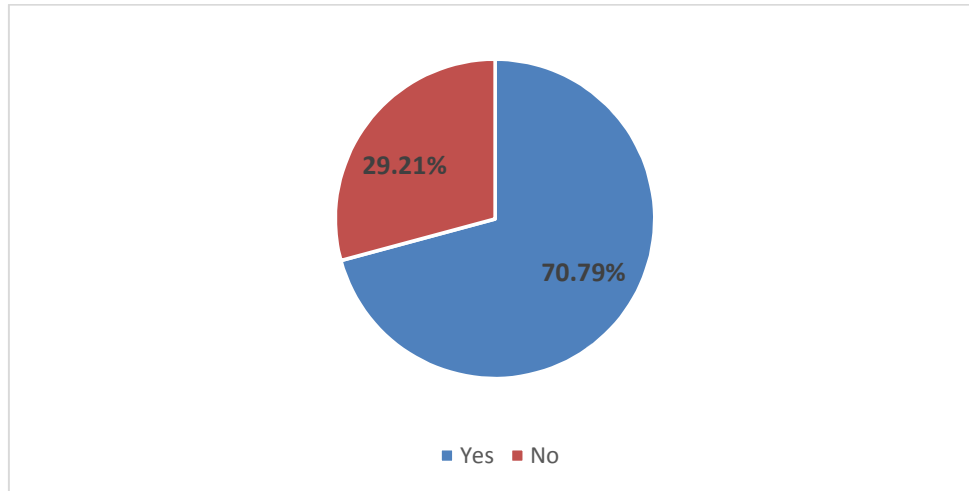


Fig. 21. Would you try a different type of contact lens than the one you are already using

Table 22. Have you considered making a permanent discontinuation of contact lenses?

	Participants	Frequency Percentage (%)
Yes	90	23,68%
No	290	76,32%

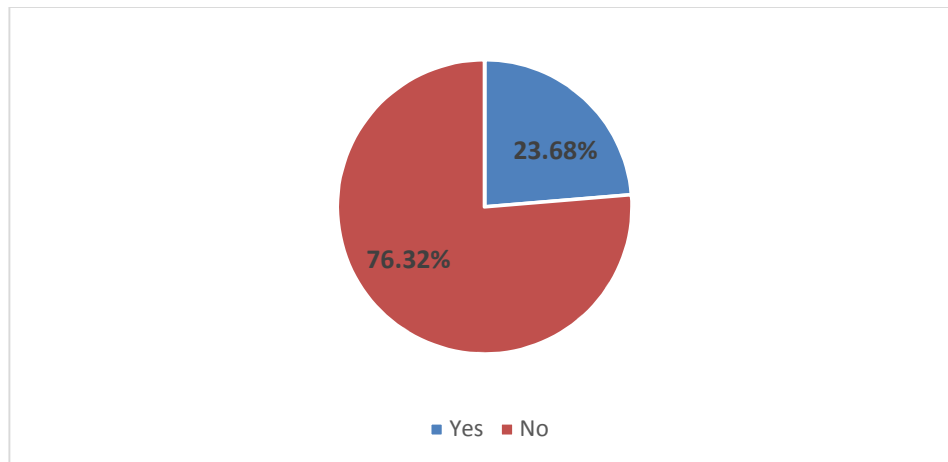


Fig. 22. Have you considered making a permanent discontinuation of contact lenses

Table 23. Have you ever had an infection due to contact lenses?

	Participants	Frequency Percentage (%)
Yes	100	26,32%
No	280	73,68%

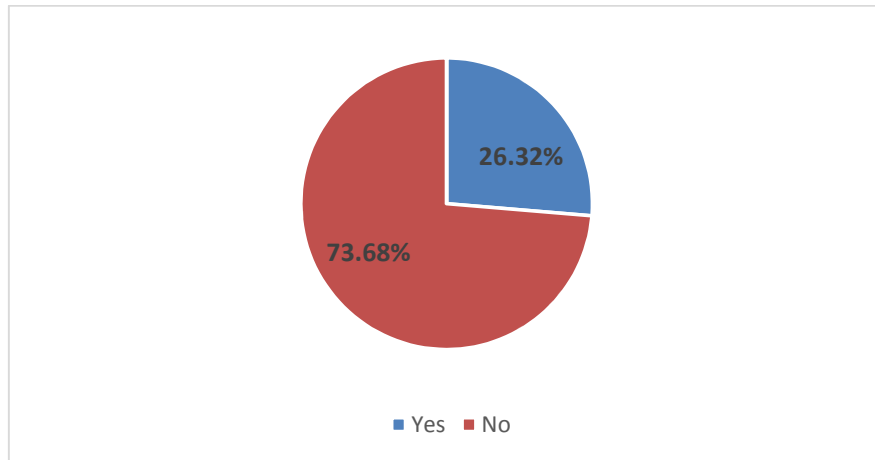


Fig. 23. Have you ever had an infection due to contact lenses

Table 24. Have you ever considered using colored contact lenses?

	Participants	Frequency Percentage (%)
Yes	100	26,32%
No	280	73,68%

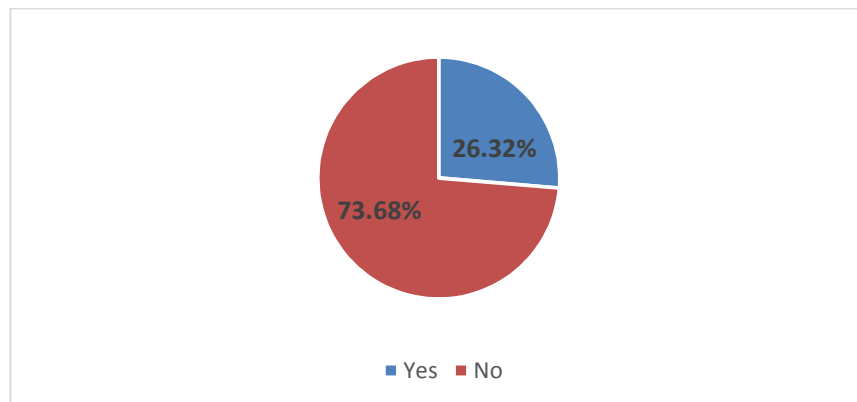


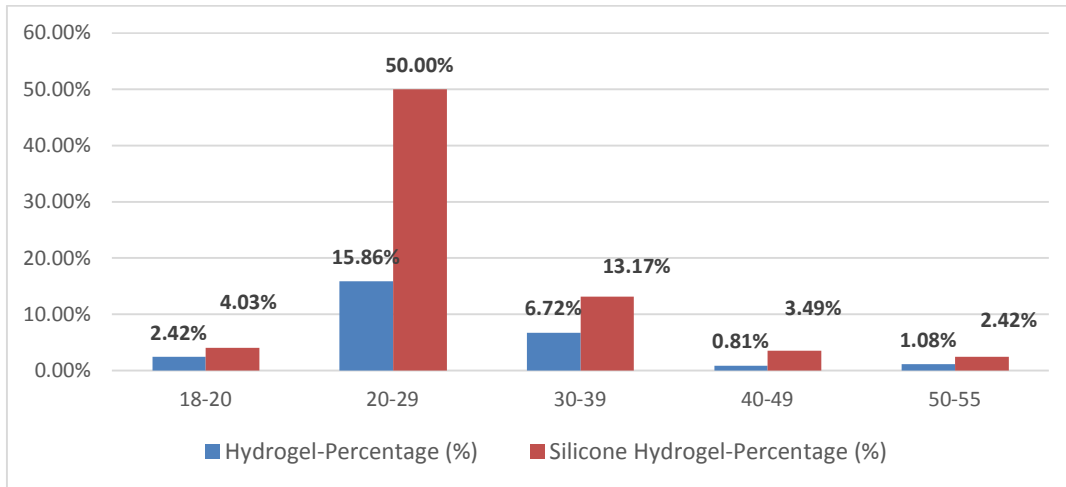
Fig. 24. Have you ever considered using colored contact lenses

In addition, there was an analysis on the relation between the age and the type of material they preferred, the age and the replacement scheme they follow, the hours and days per week of use, for those who answered that they use soft contact lenses. Also there was an analysis

according to age on the difficulty they have on fitting or removing their contact lenses, their satisfaction and vision quality. An important question was if the sleep with their lenses and if they had any infection during their use of contact lenses.

Chart 1. Lens Material according to age

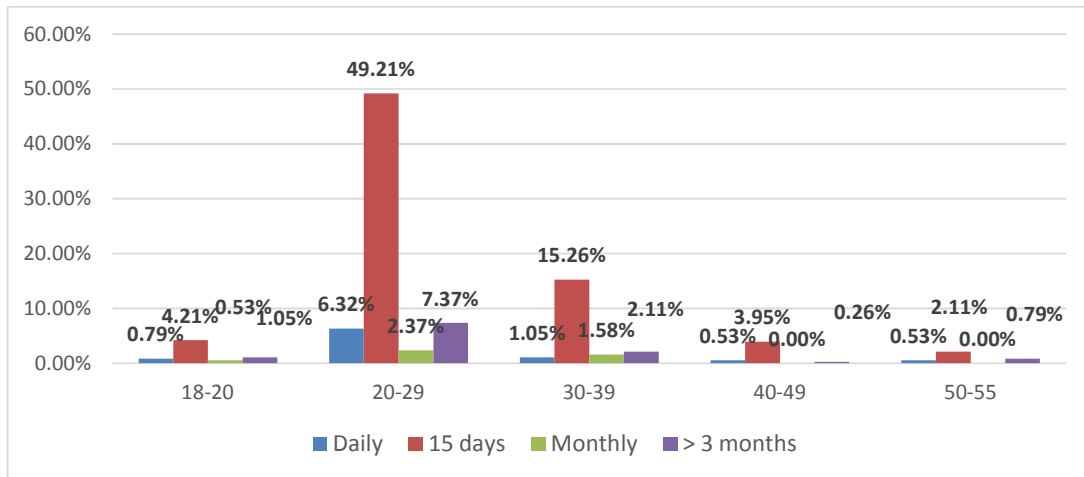
Age	Hydrogel-Percentage (%)	Silicone Hydrogel-Percentage (%)
18-20	2,42%	4,03%
20-29	15,86%	50,00%
30-39	6,72%	13,17%
40-49	0,81%	3,49%
50-55	1,08%	2,42%



Graph 1. Lens Material according to age

Chart 2. Age and Replacement scheme

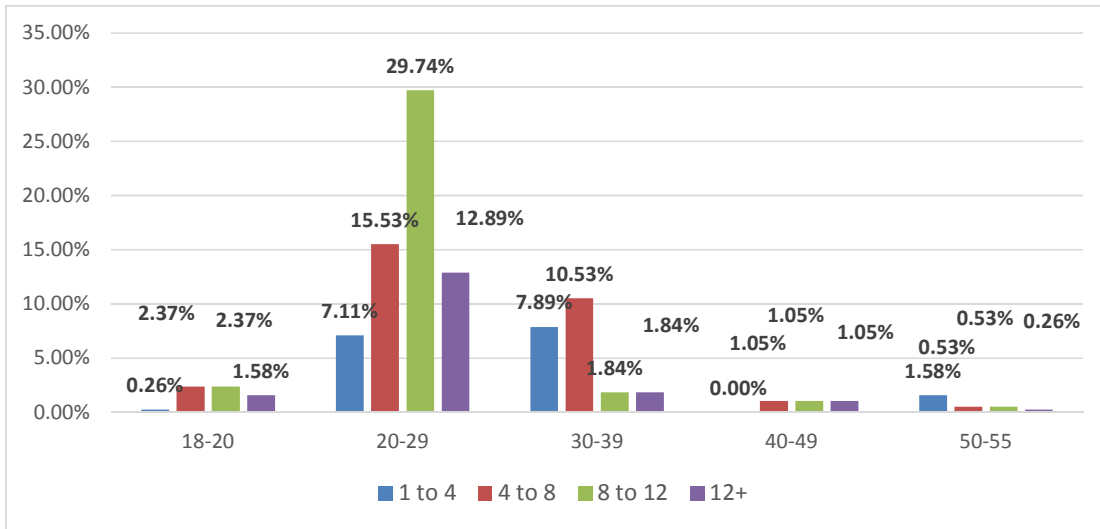
Age	Daily	15 days	Monthly	> 3 months
18-20	0,79%	4,21%	0,53%	1,05%
20-29	6,32%	49,21%	2,37%	7,37%
30-39	1,05%	15,26%	1,58%	2,11%
40-49	0,53%	3,95%	0,00%	0,26%
50-55	0,53%	2,11%	0,00%	0,79%



Graph 2. Age and Replacement scheme

Chart 3. Age - Hours of daily use

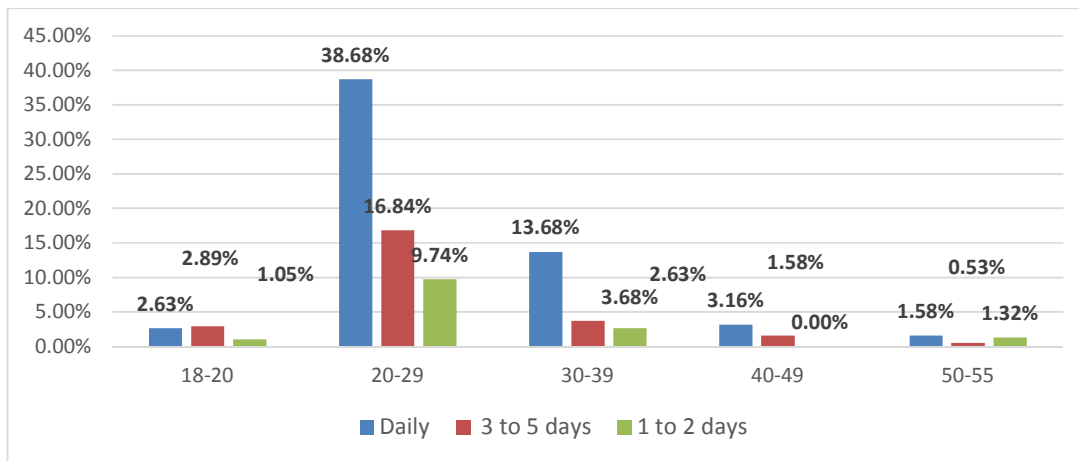
Age	1 to 4 hours	4 to 8 hours	8 to 12 hours	12+
18-20	0,26%	2,37%	2,37%	1,58%
20-29	7,11%	15,53%	29,74%	12,89%
30-39	7,89%	10,53%	1,84%	1,84%
40-49	0,00%	1,05%	1,05%	1,05%
50-55	1,58%	0,53%	0,53%	0,26%



Graph 3. Age - Hours of daily use

Chart 4. Age - Days of the week usage

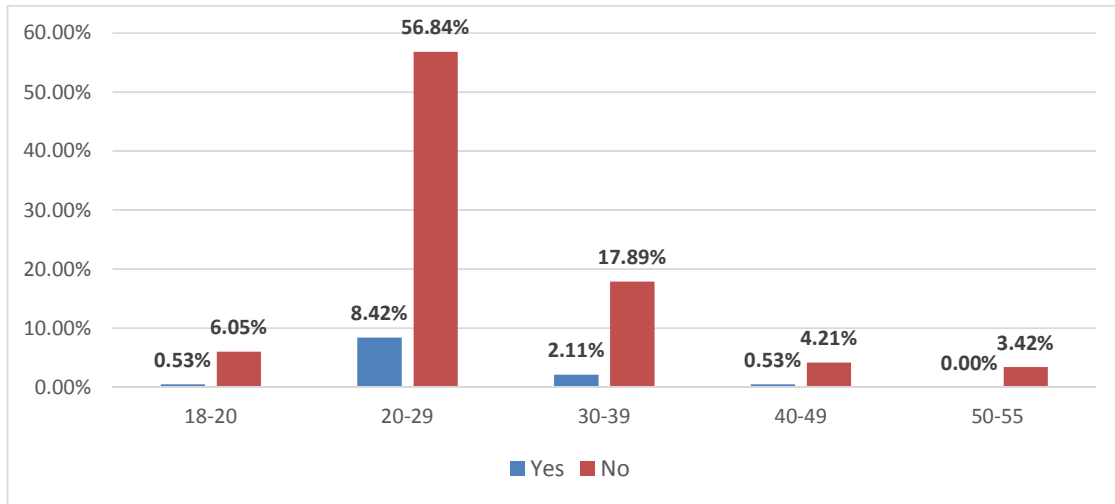
Age	Daily	3 to 5 days	1 to 2 days
18-20	2,63%	2,89%	1,05%
20-29	38,68%	16,84%	9,74%
30-39	13,68%	3,68%	2,63%
40-49	3,16%	1,58%	0,00%
50-55	1,58%	0,53%	1,32%



Graph 4. Age - Days of the week usage

Chart 5. Age - Difficulty of Application and Removal

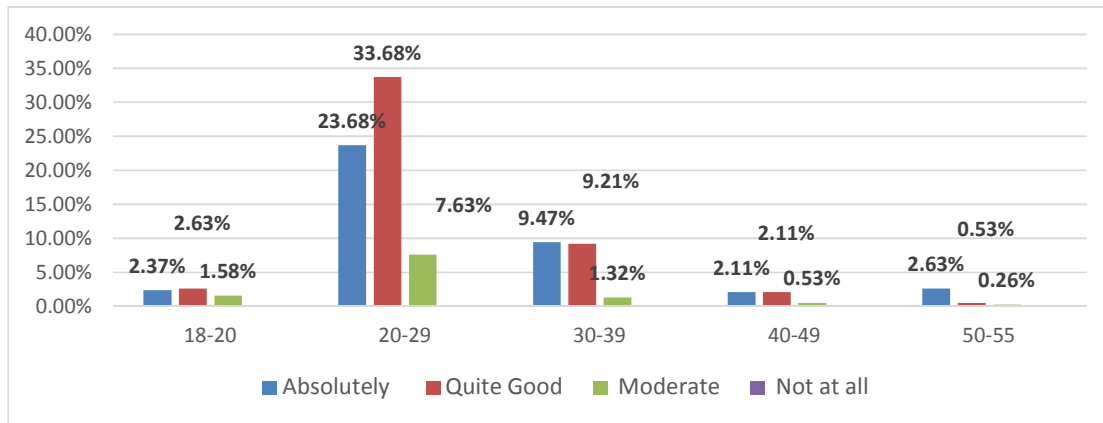
Age	Yes	No
18-20	0,53%	6,05%
20-29	8,42%	56,84%
30-39	2,11%	17,89%
40-49	0,53%	4,21%
50-55	0,00%	3,42%



Graph 5. Age - Difficulty of Application and Removal

Chart 6. Age - Lens satisfaction

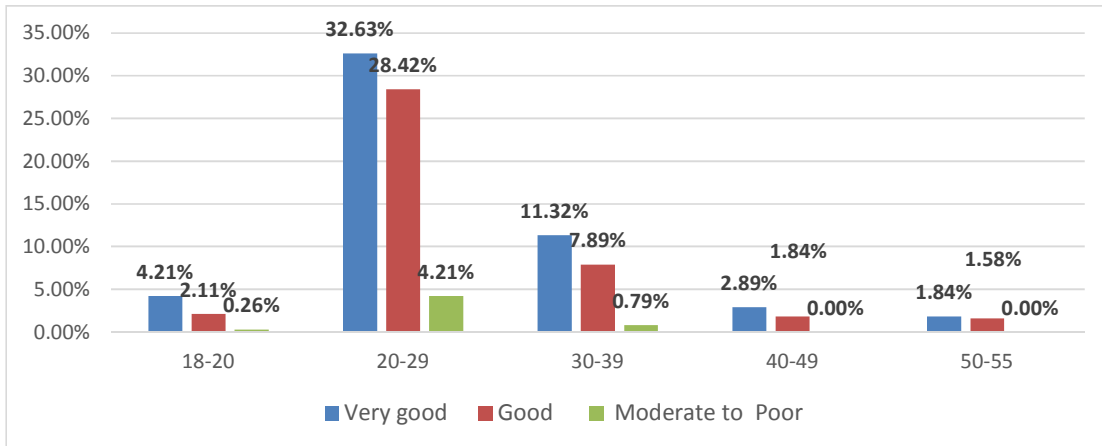
Age	Absolutely	Quite Good	Moderate	Not at all
18-20	2,37%	2,63%	1,58%	0,00%
20-29	23,68%	33,68%	7,63%	0,26%
30-39	9,47%	9,21%	1,32%	0,00%
40-49	2,11%	2,11%	0,53%	0,00%
50-55	2,63%	0,53%	0,26%	0,00%



Graph 6. Age - Lens satisfaction

Chart 7. Age - Quality of vision

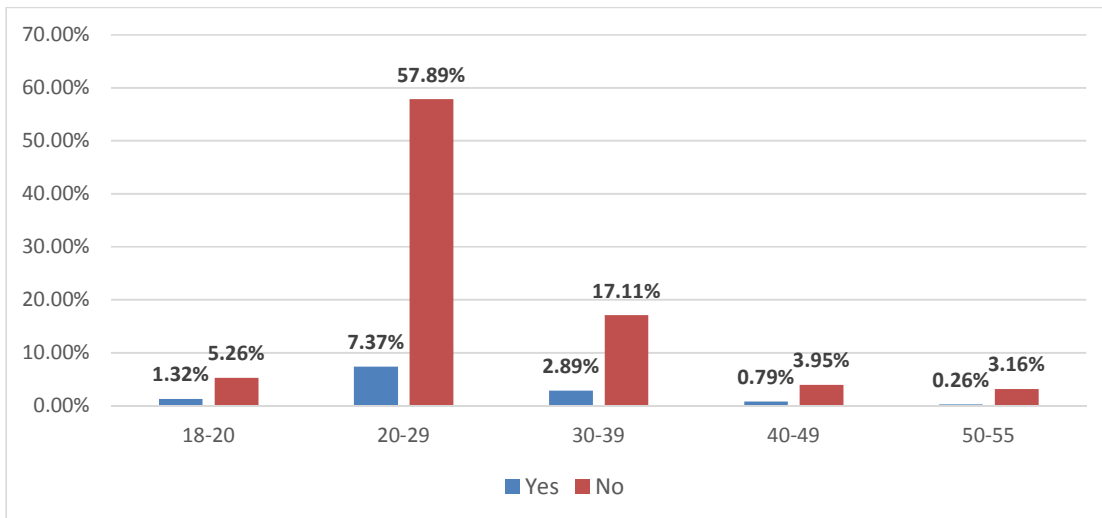
Age	Very good	Good	Moderate to Poor
18-20	4,21%	2,11%	0,26%
20-29	32,63%	28,42%	4,21%
30-39	11,32%	7,89%	0,79%
40-49	2,89%	1,84%	0,00%
50-55	1,84%	1,58%	0,00%



Graph 7. Age - Quality of vision

Chart 8. Age - Sleep with lenses

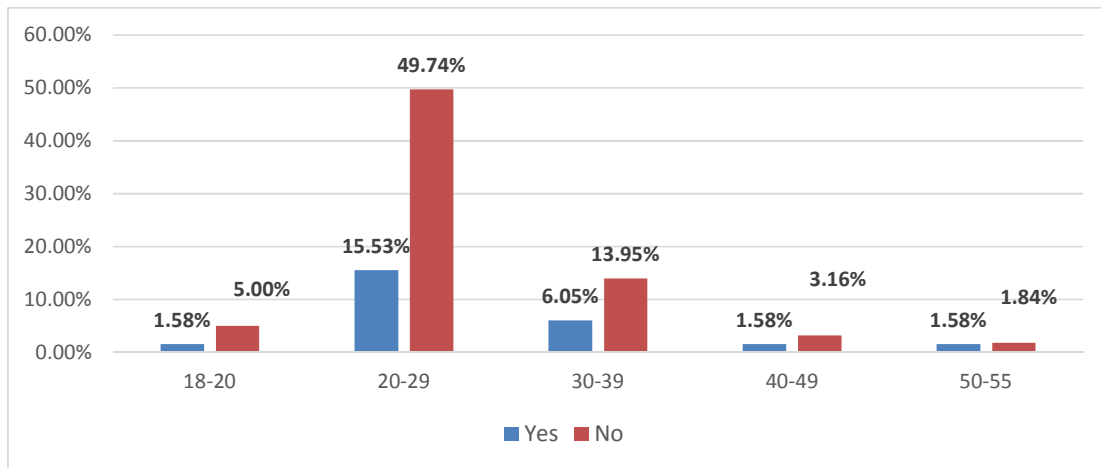
Age	Yes	No
18-20	1,32%	5,26%
20-29	7,37%	57,89%
30-39	2,89%	17,11%
40-49	0,79%	3,95%
50-55	0,26%	3,16%



Graph 8. Age - Sleep with lenses

Chart 9. Age - Infection due to CLs

Age	Yes	No
18-20	1,58%	5,00%
20-29	15,53%	49,74%
30-39	6,05%	13,95%
40-49	1,58%	3,16%
50-55	1,58%	1,84%



Graph 9. Age - Infection due to CLs

4. CONCLUSION

The results of the research with particular importance showed that only a 2,11% uses hard contact lenses, the users wear contact lenses all days of the week (59,74%), with a daily use of 8 to +12 hours (64,22%). Appearance is the first reason why users chose contact lenses and 85% follow the hygiene rules they were given. In terms of quality of vision (94,74%) and comfort during the application (88,42%), the ratings were positive for most users, and at the same time they are equally satisfied with their contact lenses. Similarly, the 88.4% of users reported no problems inserting and removing contact lenses. Only 26,32% reported to have an infection caused by their contact lenses. The signs that seem to encourage users to replace their lenses are mainly dry eyes (29.2%), intolerance (22.1%) and blurred vision (20.3%).

Users were also asked about the quality of the information they received from their opticians about cleaning and storing contact lenses. Despite the fact that the information from Optician-Optometrist was characterized as "good" (91,84%), there was a percentage of 9.5% who answered that they do not follow the rules of hygiene.

The trend of using silicon hydrogel lenses appears to be the highest (50%) among the age group of 20-29 years old, although a 15,86% of this age still use hydrogels. Also, at this age group the majority prefers a 15 days replacement scheme (49,21%). The same age group uses daily (38,68%) CLs for more than 8 hours (42,63%) reporting good vision (61,05%), while a

7,37% of this group sleep with their lenses. Also this age group reported the higher percentage of having an infection due to CLs (15,53%).

All the above results showed that there is a need to further investigate the performance of contact lenses through the answers of the CLs wearers, both in the global scientific community and in Greece, to provide more scientific literature on this issue and following the trends of the industry.

CONSENT

As per international standard or university standard guideline participant consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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