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Spectacle coverage for presbyopia correction and its associated factors among employees of an academic centre in Tehran

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Near-vision is important for employees to reach better performance. The prevalence of uncorrected presbyopia ranges from less than 10–90% according to various sociodemographic factors including age, sex, educational level, affordability, and awareness. Current study aims to determine the prevalence of spectacle coverage for presbyopia correction and its associated factors among adult employees of a university. A cross-sectional study was conducted on Tehran University of Medical Sciences' staffs aged ≥ 30 years in 2018–2019. All participants were assessed for distance and near visual acuities. Presbyopia was defined as inability to read 20/50 (N8) at 35 cm despite of corrected distance VA of at least 20/50 in the better eye. Total spectacle coverage for presbyopia was calculated as the number of participants with current near vision spectacle/number of participants with presbyopia. If persons with presbyopia had spectacles that allowed near vision to improve to 20/50 (N8) or better, it was true near spectacle coverage. Included was 4022 participants with mean (standard deviation) age of years 43.61 (7.92) years (range: 30–75 years). The prevalence of presbyopia was found to be 12.6% (507/4022). The total and true spectacle coverage for presbyopia correction were 35.9% (182/507) and 22.7% (115/507), respectively. Female (OR = 4.89, 95%CI = 1.82–13.18, *P* = 0.002), age ≥ 45 years (OR = 18.69, 95%CI = 1.69-206.18, *P* = 0.02), hyperopic refractive error (OR = 5.61, 95%CI = 1.75–17.93, *P* = 0.004), and poor to fair level of general health (OR = 2.94, 95%CI = 1.16–7.69, *P* = 0.02) were factors significantly associated with the total spectacle coverage. Academic educational level (OR = 2.76, 95%CI = 1.03–7.45, *P* = 0.04) and poor to fair general health (OR = 3.45, 95%CI = 1.41–8.33, *P* = 0.007) affected the true spectacle coverage. Nearly one-third of employees with presbyopia used spectacle for near vision, among whom 63% had true near spectacle. Near spectacle use was higher in elderly females with hyperopia and poor to fair general health. People with academic educational level and poor-fair general health wore true near spectacle.

Keywords Uncorrected presbyopia, Employee, Adult, Near spectacle, Associated factors

Correctable near vision impairment has been considered as presbyopia and should be distinguished from uncorrectable impairment secondary to other ocular comorbidities[1] Globally, presbyopia is a public health concern affecting over a billion people, among them, 45% remains uncorrected[2,3] Consequently, uncorrected presbyopia is the leading cause of near visual impairment throughout the world[2-4].

Presbyopia is a progressive age-related decline in the amplitude of accommodation due to reduction of crystalline lens elasticity. The symptoms of presbyopia are difficulty in near visual task performance, visual discomfort such as eye strain, and headache. It needs the addition of a near correction to the presenting distance refractive correction to achieve better near visual acuity.

The age of presbyopia onset coincides with productive age. Presbyopia increases from a low prevalence at 35 years to a peak at 55 years[1] The uncorrected presbyopia has economic impact, specifically in low and

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middleincome countries[5,6] Lack of clear near vision prevents workers from near tasks especially manual tasks with high near visual demand. This causes more than 25.4 billion-dollars of economic loss globally[7].

The vast majority of studies of near vision impairment to date, have focused on general population and there are very few studies assessing presbyopia correction among employees[8] and special occupations such as teachers[9-11], cloth weavers[12] and, marine fishers[13] The prevalence of uncorrected presbyopia has been estimated from less than 10–90% although the presbyopia related vision impairment is reversible (supplement digital content 1). Such a wide range can be attributed to various sociodemographic factors for uncorrected presbyopia including age, sex, educational level, affordability, awareness and etc. (supplement digital content 1). While the various sociodemographic and economic factors mentioned have been associated with uncorrected presbyopia (supplement digital content 1), additional exploration in specific circumstances is still warranted. Indeed, an estimate of the uncorrected presbyopia and its related factors is essential for advocacy and planning. The World Health Organization recommend high priority of presbyopia correction for communities with less than one-third presbyopia correction[14] No previous study specifically assessed the related factors of uncorrected presbyopia among employees although appropriate correction of presbyopia causes an increase in productivity[5] Therefore, this study was primarily aimed at studying the prevalence of presbyopia and near spectacles coverage among employees. The secondary objective was to relate this prevalence and uncorrected presbyopia with the various sociodemographic factors.

Methods

We conducted a cross-sectional study from January 2018 to December 2019 as the first phase of Tehran University of Medical Sciences' Cohort (TEC) Study[15] Tehran University of Medical Sciences is the first established and the largest institute of medical sciences in Iran with approximately 19,000 employees. The method and protocol of the TEC cohort has been described, previously[15] The Cohort was followed the Declarations of Helsinki and it has been approved by Tehran University of Medical Sciences ethics committee and the ministry of health and medical education under registration codes IR.REC.1396.4265 and IR.REC.1398.246, respectively. The informed consent was obtained from all participants. In the current study, part of the data collected in the TEC cohort enrolment phase was used. Included were individuals older than 30 years (the lowest cut-off points in previous studies of presbyopia[1,2] who had the employment relationship with Tehran University of Medical Sciences. There were no other exclusion criteria. Official invitations were made using phone, short message service, the study's website, through the focal points, and in person. All staff were allowed to enter the study voluntarily. All participants voluntarily signed the informed consent form at the study centre. Participants in the study included a variety of departments including: office workers, clinical workers, laboratory staff, services workers, and security guard staff. The occupation types were classified as office workers (who spent work-time reading, writing and working with computers) and non-office workers (who had extra manual and physical tasks).

All examinations and data collection for each person were performed in one working day at the designated center (a temporary location to examine only study participants during study period) by trained personnel and according to the approved protocol of the study. All data collection steps were supervised by independent quality control and assurance team. Participants scored their own general health through the health domain of the Copenhagen Psychosocial Questionnaire (COPSOQ) short version as 0 (poor), 1 (fair), 2 (good), 3 (very good) or 4 (excellent)[16] We re-categorized the scores into two classes: poor-fair and good-to-excellent. The socioeconomic status was measured with asset-based socioeconomic indicator (wealth index). The categorical principal component analysis was applied to the net assets of each participant and the wealth index will be created[15,16,17].

Examination

Ocular examination was carried out using distance and near vision charts, loose lens trial sets, and streak retinoscopy. Initially, the distance visual acuities (including uncorrected, presenting and best corrected) were assessed, as described previously[18] Near vision was then evaluated monocularly over distance refractive correction under normal room illumination. A near Snellen chart was held at a fixed distance of 35 cm from the participants' eyes. The visual acuity was recorded as the smallest line read with one or no errors. Near add was determined for all adults who did not achieve the vision of 20/50 (N8) on the near vision chart unaided or with their best distance spectacles, using spherical lenses of increasing plus power. Plus lenses were added on the trial frame in a step of + 0.25 diopters until there is no difference of near visual acuity with additional + 0.25 diopters lens. Participants whose near vision was corrected to the level of 20/50 (N8) or better were given a formal spectacle prescription. Those participants whose vision did not improve with correction were referred to an eye hospital for further evaluation.

Definition

Presbyopia was considered in individuals aged ≥ 30 years with a presenting or corrected distance VA of at least 20/50 in the better eye. It was defined as inability to read 20/50 (N8) at 35 cm despite of distance refractive correction, which can be corrected to 20/50 (N8) or better with near correction. An employee was considered a near-spectacle user if the spectacle was, previously, prescribed by an ophthalmologist or optometrist. *Total spectacle coverage* (%) for presbyopia was determined as: the total number of participants with current near vision spectacle / (total number of presbyopic participants) × 100.[19] *True spectacle coverage* was considered if persons with presbyopia had spectacles that allowed near vision to improve to 20/50 (N8) or better[19] Distance subjective refraction was used to classify refractive status. Myopia was defined as a spherical equivalent subjective refraction < −0.5 diopter (D). A spherical equivalent refraction > 0.5 was defined as hyperopia, and values within the range of −0.5 ≤ spherical equivalent ≤ + 0.5 D were considered emmetropia. A cylinder refraction equal to or greater than 1.5 D was taken for high astigmatism. With the rule astigmatism was considered when the

patient needed a concave cylindrical lens at 180 ± 30 degrees. Eyes, which required a concave cylindrical lens at 90 ± 30 degrees were categorized as against the rule astigmatism. Other cylindrical axis was classified as oblique astigmatism.

Statistical analysis

Data were entered and managed in SPSS for Windows software version 24.0 (SPSS Inc., Chicago IL, USA). The data of the better eye was used for statistical analysis. The prevalence of presbyopia and spectacles coverage were calculated and reported as percentages. Univariate analysis was performed using chi-square test. Multivariable analysis was carried out using binary logistic regression for determining associated sociodemographic factors with spectacle coverage. The p-value less than 0.05 was considered statistically significant.

Results

In total, 4022 participants were included in the analysis. The mean (standard deviation (SD)) age was 43.61 (7.92) years (range: 30–75 years). Of all participants, 60.2% (2422) were women, 81.3% (3271) were married, 73.0% (2933) had academic education, and 41.7% (1482) were office-worker (Table 1). In terms of systemic conditions, 4.1% (166) reported having diabetes, 2.7% (109) had rheumatologic disease and 16.4% (659) mentioned other underlying systemic disorders. More than 80% (80.5%, 3234) of the individuals had good to excellent general health (Table 1). The coverages of basic and supplement insurances were 88.4% (3555) and 54.5% (2190) respectively. Based on the definition of presbyopia, there were eight persons with mean distant BCVA of 0.78 ± 0.19 logMAR whose near visual acuity did not improve and excluded. The prevalence of presbyopia was found to be 12.6% (507). Table 1 shows the prevalence of presbyopia in various sociodemographic subgroups. Higher prevalence was observed among those older than 45 years (29.3%, 473/1614). There were only six persons with age less than 40 years. All of them have plane refraction for far and were prescribed near-glasses of one-dioptre. The prevalence of presbyopia among married participants, participants with academic education, and office workers was 13% (426/3271), 11.1% (325/2933) and 18.2% (270/1482), respectively (Table 1). In terms of refractive status, the highest prevalence of presbyopia was observed among subjects with hyperopia (16.5%, 22/133) followed by myopia (7.5%, 46/610) and emmetropia (6.5%, 165/2531).

Of 507 subjects with presbyopia, 35.9% (182) were using spectacles for near. The true near vision spectacle coverage among employees was 22.7% (115). Females ($P_{\text{total spectacle coverage}}<0.001$, $P_{\text{true spectacle coverage}}=0.003$), people older than 45 years ($P_{\text{total spectacle coverage}}=0.02$, $P_{\text{true spectacle coverage}}=0.01$), office workers ($P_{\text{total spectacle coverage}}=0.008$, $P_{\text{true spectacle coverage}}=0.04$) and subjects with hyperopia ($P_{\text{total spectacle coverage}}<0.001$, $P_{\text{true spectacle coverage}}=0.003$) had higher total and true spectacle coverages compared to their counterparts (Table 1). Moreover, total spectacle coverage was higher among singles ($P = 0.01$) and employees with supplementary insurance coverage ($P = 0.02$). On applying multiple logistic regression analysis, the odds of total spectacle coverage were higher in females (OR = 4.89, 95%CI = 1.82–13.18, $P = 0.002$), subjects older than 45 years (OR = 18.69, 95%CI = 1.69–206.18, $P = 0.02$), hyperopic refractive error (OR = 5.61, 95%CI = 1.75–17.93, $P = 0.004$), and people with poor to fair general health (OR = 2.94, 95%CI = 1.16–7.69, $P = 0.02$) (Table 2). Moreover, the factors associated with higher true spectacle based on logistic regression analysis were academic educational level (OR = 2.76, 95%CI = 1.03–7.45, $P = 0.04$) and poor to fair general health (OR = 3.45, 95%CI = 1.41–8.33, $P = 0.007$) (Table 2).

Discussion

The present study was a cross-sectional study on the employees of an academic institution aged 30 years and more. More than 12% of participants have presbyopia. The results of current study also implied the prevalence of 36% and 23% for total and true near spectacle coverage among employees with presbyopia.

Although the presbyopia can be safely and effectively corrected with convex lenses, it has not received the proper attention it deserves. From the literatures reviewed, the uncorrected presbyopia varies from less than 10% to more than 90% in different communities (supplement digital content 1). The largely disparate prevalence rates might be due to the difference in study setting, participants, geographical regions and, partly due to issues related to the service provision and service uptake (supplement digital content 1). Moreover, definition of presbyopia is another reason for the prevalence discrepancy of the presbyopia. Majority of studies[3,5,7,9,11,13-15,17-19,22-29] used the cut-off point of 40 cm to define near-distance tasks while some considered the value less than 40 cm[2,6,10,12,30] (like current study) or an optional distance[21] for near-task evaluation. It might depend the type of activity and participants. However, reducing the near-distance value leads to overestimation of the presbyopia. Despite these differences, it can be concluded that spectacle coverage is low in several parts of the world (supplement digital content 1).

Correction of presbyopia is paramount for employees. Most of the governmental and non-governmental work activities are based on near and intermediate working distances. The uncorrected presbyopia can cause great productivity loss of office workers and limits employees from contributing to full potential. A report of the world economic forum indicated that 23% of employees compromised their work due to the near vision impairment and the unavailability of near vision correction[20] The only study about the presbyopia correction among employees is Malhotra's study reporting the prevalence of 25% for near spectacle coverage among Indian employees[8] Our results are in line with Malhotra's finding. Moreover, some studies showed nearly half of school teachers with presbyopia do not have near spectacle despite of high near visual demands[9,10,11].

Several variables might be associated with uncorrected presbyopia. Being older, female, low educated unaware of near vision problem and, non-office worker were barriers for use of presbyopia corrections[8,19,21] In addition, low income, high cost of spectacles, lack of health insurance, limited eye services, and absence of eye check-up practice reduce the correction rate of presbyopia[9,19-22] For employees, Malhotra et al.[8] reported that the uncorrected presbyopia was lower among individuals whose occupation involved office or skilled work. For

Parameter		Total in the sample	Presbyopia	Total spectacle coverage		True spectacle coverage	
		Number	Number (%)	Number (% out of presbyopia)	*p*-Value †	Number (% out of presbyopia)	*p*-Value †
No. of participants		4022	507 (12.6%)	182 (35.9%)	-	115 (22.7%)	-
Gender	Male	1597	224 (14.0%)	54 (24.1%)	**< 0.001**	37 (16.5%)	**0.003**
	Female	2422	283 (11.7%)	128 (45.2%)		78 (27.6%)	
Age	≤ 45 years	2408	34 (1.4%)	6 (17.6%)	**0.02**	2 (5.9%)	**0.01**
	> 45 years	1614	473 (29.3%)	176 (37.2%)		113 (23.9%)	
Diabetes	Yes	166	44 (26.5%)	14 (31.8%)	0.56	9 (20.5%)	0.71
	No	3856	463 (12%)	168 (36.3%)		106 (22.9%)	
Underlying Cancer	Yes	18	5 (27.8%)	3 (60%)	0.36	1 (20%)	0.87
	No	4004	502 (12.5%)	179 (35.7%)		114 (22.7%)	
Underlying Rheumatologic Disease	Yes	109	26 (23.9%)	11 (42.3%)	0.48	6 (23.1%)	0.96
	No	3913	481 (12.3%)	171 (35.6%)		109 (22.7%)	
Other internal underlying diseases	Yes	659	87 (13.2%)	39 (44.8%)	0.06	21 (24.1%)	0.72
	No	3363	420 (12.5%)	143 (34%)		94 (22.4%)	
Smoking	Yes	632	109 (17.2%)	35 (32.1%)	0.35	22 (20.2%)	0.48
	No	3390	398 (11.7%)	147 (36.9%)		93 (23.4%)	
Education levels	Elementary	1086	182 (16.8%)	57 (31.3%)	0.11	36 (19.8%)	0.24
	Academic	2933	325 (11.1%)	125 (38.5%)		79 (24.3%)	
Marital status	Single	748	81 (10.8%)	39 (48.1%)	**0.01**	23 (28.4%)	0.18
	Married	3271	426 (13%)	143 (33.6%)		92 (21.6%)	
Basic Insurance Coverage	Yes	3555	466 (13.1%)	170 (36.5%)	0.36	104 (22.3%)	0.51
	No	467	41 (8.8%)	12 (29.3%)		11 (26.8%)	
Supplementary Insurance Coverage	Yes	2190	294 (13.4%)	119 (40.5%)	**0.02**	72 (24.5%)	0.14
	No	1365	172 (12.9%)	51 (29.7%)		32 (18.6%)	
Occupation	Office worker	1482	270 (18.2%)	112 (41.5%)	**0.008**	69 (25.6%)	**0.04**
	Non-office worker	2073	196 (9.5%)	58 (29.6%)		35 (17.9%)	
Socioeconomic status	Poorest	734	98 (13.4%)	31 (31.6%)	0.12	20 (20.4%)	0.52
	Poor	860	117 (13.6%)	54 (46.2%)		32 (27.4%)	
	Intermediate	927	125 (13.5%)	42 (33.6%)		23 (18.4%)	
	Rich	750	90 (12.0%)	31 (34.4%)		22 (24.4%)	
	Richest	751	77 (10.3%)	24 (31.2%)		18 (23.4%)	
COPSOQ general health	Poor to fair	445	89 (20%)	38 (42.7%)	0.17	27 (30.3%)	0.05
	Good to excellent	3234	375 (11.6%)	131 (34.9%)		77 (20.5%)	
Refractive status ‡	Emmetropia	2531	165 (6.5%)	65 (40.1%)	**< 0.001**	46 (28.4%)	**0.003**
	Myopia	610	46 (7.5%)	2 (4.5%)		5 (11.4%)	
	Hyperopia	133	22 (16.5%)	20 (74.1%)		13 (48.1%)	
Astigmatism‡	< 1.5 Diopter	2958	204 (6.9%)	86 (38.7%)	0.06	1 (9.1%)	0.16
	≥ 1.5 Diopter	316	29 (9.2%)	1 (9.1%)		63 (28.4%)	
Type of astigmatism ‡	With the rule	2534	173 (6.8%)	68 (39.3%)	0.32	53 (30.6%)	0.16
	Against the rule	554	45 (8.1%)	16 (35.6%)		9 (20%)	
	Oblique	187	15 (8.0%)	3 (20%)		2 (13.3%)	

Table 1. Characteristics of 4022 participants and the prevalence of presbyopia and spectacle coverage. †: Chi-square test; ‡: based on the better eye; COPSOQ: Copenhagen Psychosocial Questionnaire.

school teachers, Munaw et al.[9] identified that being younger than 45 years, female, unaware of presbyopia and, self-rating of current near vision as good by the respondent were factors significantly associated with the unmet need for presbyopia correction.

Refractive status affects near spectacle coverage for presbyopia. Previous studies have shown that subjects who needed higher plus near corrective lenses were more likely to have near vision spectacle correction as compared to those who needed less near corrective lens[23,24] Individuals who need a high amount of plus lens (near add) might have moderate-severe near visual problems that may challenge them to perform their near activities. Elderly and hyperopic adults are two groups who need more add power for presbyopia correction. Indeed, hyperopic adults lose near visual acuity earlier, while those with low to moderate myopia can be protected from near vision impairment. Tsuneyoshi et al.[25] observed that the subjective refraction of patients unaware of presbyopia was significantly more myopic than those aware of the presbyopia[25] Similarly, current study has

Parameter		Total spectacle coverage		True spectacle coverage	
		Odds ratio (95% Confidence Interval)	*p-Value*†	*Odds ratio (95% Confidence Interval)*	*p-Value*†
Gender	Male	1	**0.002**	1	0.18
	Female	4.89 (1.82–13.18)		1.92 (0.74–4.96)	
Age	≤ 45 years	1	**0.02**	1	0.08
	> 45 years	18.69 (1.69–206.18)		2.41 (0.91–6.38)	
Diabetes	No	1	0.23	1	0.39
	Yes	0.41 (0.10–1.74)		0.52 (0.12–2.35)	
Underlying Cancer	No	1	0.29	1	0.90
	Yes	2.64 (0.44–15.96)		0.87 (0.10–7.86)	
Underlying Rheumatologic Disease	No	1	0.34	1	0.57
	Yes	0.25 (0.01–4.40)		0.47 (0.04–6.41)	
Other internal underlying diseases	No	1	0.28	1	0.10
	Yes	0.59 (0.23–1.52)		0.44 (0.17–1.18)	
Smoking	No	1	0.51	1	0.11
	Yes	1.49 (0.45–4.99)		2.53 (0.81–7.90)	
Education levels	Elementary	1	0.19	1	**0.04**
	Academic	1.93 (0.72–5.20)		2.76 (1.03–7.45)	
Marital status	Single	1	0.66	1	0.20
	Married	1.27 (0.44–3.65)		0.51 (0.18–1.43)	
Basic Insurance Coverage	No	1	0.37	1	0.51
	Yes	1.38 (0.68–2.76)		0.79 (0.38–1.62)	
Supplementary Insurance Coverage	No	1	0.75	1	0.65
	Yes	0.88 (0.39–1.96)		0.65 (0.29–1.45)	
Occupation	Non-office worker	1	0.37	1	0.45
	Office worker	1.42 (0.66–3.05)		1.35 (0.62–2.91)	
Socioeconomic status	Poorest	1	-	1	-
	Poor	0.99 (0.30–3.29)	0.99	1.05 (0.32–3.46)	0.94
	Intermediate	0.77 (0.24–2.52)	0.67	0.74 (0.22–2.49)	0.63
	Rich	0.85 (0.24–3.01)	0.81	0.87 (0.24–3.15)	0.83
	Richest	0.83 (0.21–3.36)	0.79	1.07 (0.28–4.16)	0.92
COPSOQ general health	Good to excellent	1	**0.02**	1	**0.007**
	Poor to fair	2.94 (1.16–7.69)		3.45 (1.41–8.33)	
Refractive status ‡	Emmetropia	1	-	1	-
	Myopia	0.08 (0.02–0.40)	**0.002**	0.43 (0.13–1.38)	0.16
	Hyperopia	5.61 (1.75–17.93)	**0.004**	2.08 (0.72–5.95)	0.18
Astigmatism ‡	< 1.5 Diopter	1	0.72	1	0.79
	≥ 1.5 Diopter	0.60 (0.04–9.32)		0.71 (0.06–9.17)	
Type of astigmatism ‡	With the rule	1	-	1	-
	Against the rule	0.85 (0.43–1.69)	0.16	0.57 (0.26–1.26)	0.16
	Oblique	0.38 (0.11–1.42)	0.15	0.35 (0.08–1.60)	0.18

Table 2. Logistic regression analysis for identifying factors for spectacle coverages. †: Binary logistic regression; ‡: based on the better eye; COPSOQ: Copenhagen Psychosocial Questionnaire.

shown that the near spectacle coverage was higher in hyperopic employees. More accommodative demand of hyperopic eyes for near tasks might increase the awareness of presbyopia and felt need.

Age is another factor associated with uncorrected presbyopia[9,19,23,26] Adults younger than 45 years are more likely to have an unmet need for presbyopia correction compared to elderly[9,19,26] Our results were in agreement with previous reports. The possible explanation could be due to more near visual reduction in elderly necessitates them to have correction compared to the younger adults. On the other hand, near vision impairment in the younger adults may have greater functional significance, as this group may be more likely to be engaging in near tasks[21].

There is no consensus regarding the effect of gender on uncorrected presbyopia. Some studies[9,19,26-28] found higher prevalence of uncorrected presbyopia among females while the others[8,21] reported reverse results. This is due to earlier onset of presbyopia in women due to physiological and physical reasons besides long life expectancy compared to men[29] It is compounded by the economic inequality causing less opportunity for women to afford spectacles[30] Contrary, current study showed that the spectacle coverage was higher among

female employees. Female employees may have better ability to afford and therefore, less affected by economic constraints comparing to unemployed women.

Previous studies have proposed a reverse association between uncorrected presbyopia and education[8,12,13,26,31,32] Higher educational level leads to lower near vision impairment[8,12,13,26,31,32] In current study, the near spectacle coverage was not different between employees' with and without academic education. However, true near spectacle coverage was significantly higher in educated employees after considering other variables in regression analysis. It implies that educational level could be an indicator of other variables such as socioeconomics, awareness and felt need. In other words, educational levels, affordability and awareness are interrelated factors. Educated employees have a better socioeconomic status and hence seeking eye care. In addition, educated people could access many sources of information and knowledge about near vision problems which might contribute to eye check-up practices including near vision refraction[33] Also, employees with higher educational levels perform more near tasks such as reading, writing and working with computer. Therefore, they are more sensitive to decreased near vision and have a greater felt-need for visual correction. Indeed, normative need and felt need are different in presbyopia due to different daytoday activities[8] Majority of the presbyopia people remained uncorrected mainly because they do not face problems in daily activities[8].

High cost and unaffordability are the main barriers reported for low correction coverage (unmet need) for near vision[34] Some studies have found that a high proportion of near vision impairment remains uncorrected in areas of limited resources[31,35] The provision of spectacles at a low cost, and a pricing system that is affordable and equitable is required to address this issue. In this respect, provision of readymade spectacles for presbyopia have been done in the developing countries[36].

Nearly 15–20% of people with presbyopia aged 45 years are unaware of the presbyopia despite difficulty performing near tasks[25] Lack of awareness of presbyopia is one of the barriers for seeking presbyopia correction despite of easy access to treatment[1,9,10,11,13,23,24] This might be since awareness of eye problems influences eye healthcare-seeking behaviour. Awareness about near vision problems motivates people to search for and read more materials which encourage them to decide to wear near corrections. Meanwhile, eye check-ups could provide supporting information and health education for the eye problems including near vision spectacle correction options and increase the awareness[17,20,24].

Underlying systemic disease may affect near spectacle coverage[32] Similarly, current study showed that employees with poor to fair general health condition had three times higher odds for near spectacle use. Frequent ocular examination of people with chronic systemic disease such as diabetes could accelerate proper diagnose and correction of presbyopia.

The current study has some limitations. First, our results may have been influenced by nonparticipation. Second, several potentially relevant factors on near vision performance such as the near point distance, the habitual reading distance, and pupillary size were not recorded. Specially, near-point-accommodation and near-point-distance might be important to distinct the early presbyopia from abnormal conditions of accommodation in young adults. Although we applied fogging and pushing-plus to avoid cycloplegic refraction for myopia, we did not measure the amplitude of accommodation which may be important in younger participants. Third, we used the COPSOQ which is self-reported and can be affected by biases such as self-reporting bias and social desirability bias. To reduce these biases, comprehensive and practical instructions and protocols were provided to the participants, ensuring that they accurately understood the precise meaning of each option on the COPSOQ scale. Additionally, the COPSOQ is a standardized and validated tool that has been used in numerous international studies, with well-stablished reliability and validity. However, we acknowledge that the use of self-reported scores has limitations.

Conclusion

The total and true spectacle coverages for presbyopia among employees in this study were 36% and 23%, respectively. Female employees as well as employees younger than 45 years, with hyperopia and poor to fair health condition have more spectacle users for presbyopia correction. The managing body of the university should run eye-health programs involving near visual acuity screening and near spectacle provision.

Data availability

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

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Author contributions

All authors contributed to the study conception and design. Material preparation and data collection were performed by RM, HP and ME. Analysis was done by PA. The first draft of the manuscript was written by PA. FA and RM commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate

Sciences ethics committee and the ministry of health and medical education under registration codes IR.REC.1396.4265 and IR.REC.1398.246, respectively. The informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Additional information

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