Improved near Vision with ready-made Spectacles for Presbyope in Chachoengsao Province

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The Objective of the present research was to study the improvement of near vision with ready-made spectacles for presbyope in Chachoengsao province. Retrospective cross-sectional analytic study was conducted in 309 volunteers at Sanamchaiket district whose ages were 35 years and above. Visual acuity was measured in presbyopic patients, and then ready-made spectacles were given as a trial. Visual acuity of near distance was measured at the time before and after correction with ready-made spectacles. Aim was to achieve the visual acuity of 20/50 or better. The number of volunteers was 129. Out of these, 96.12 percent(124 of 129) achieved the aim of the visual acuity (124 of 129). In conclusion, ready-made spectacles were effective in correcting near vision for presbyope at any group of ages and both sexes in Chachoeungsao province. If the difference of refractive error between both eyes was greater than +1.25 Diopter, ready-made spectacles were ineffective.

Keyword: *Ready-made spectacles, Presbyopia, Refractive error*

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Presbyopia is a condition in which the accommodation of the lens is lost,that leads to progressive worsening of near vision and more difficult to focus at near distance which may caused to eyeache and headache. This is an important condition found mainly in the population aged 35 and above[1], in every geographical area which affected their quality of life[1-4]. With aging, condition of presbyopia will be increased[5]. Due to the fact that working and daily life activities need the ability to focus on near objects, this condition should be corrected. It is easy to approach and inexpensive to treat by using reading spectacles. However, customized spectacles are expensive and more difficult to make than ready-made spectacles, especially for those in rural areas. Therefore, the correction of near vision with ready-made spectacles is another option which cheaper cost and more convenient in rural areas.

In consequence, the presented is the first research that develops to investigate in rural area of Thailand whether the ready-made spectacles are effective in correction of near vision.

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Material and Method

The study protocol was reviewed and approved by the Royal Thai Army Medical Department, Institutional Review Board. This cross-sectional analytic study was conducted in May 2007.The study population was 309 volunteers in Sanamchaiket, Chachoengsao province. The presented was a survey study which included all of population in Sanamchaiket district whose aged 35 years and above that completed a written consent form. The visual acuity at near distance was tested and the questionnaire was interviewed for general information and previous history of ophthalmic diseases. The exclusion criteria were age less than 35 years, the presence of uncorrected distance visual acuity less than 20/200 or best corrected visual acuity less than 20/40, the presence of 1 diopter of astigmatism, no improvement of visual acuity with pinhole, functional presbyopia, previous ocular surgery or trauma, history of ocular pathology, and inability or intolerance to test visual acuity with sitting position. All excluded subjects with visual impairment were done by in-training resident of Ophthalmology and confirmed by a general Ophthalmologist.

All subjects were measured a distance vision using a Snellen chart or E-game chart in each eye separately with correction in case of presented eyeglasses. At least correct identification of 3 of 5 characters in each line was identified as a success. A distance vision was recorded for a visual acuity of previous reading line when subjects failed to identify less than 3 characters. A visual acuity of 20/20 was recorded when all tested lines were correctly read. Pinhole correction was tested in case of visual acuity less than 20/20. Refraction with automatic refractive machine was conducted and recorded in minus cylinder value when visual acuity gained with pinhole correction. Trial lens were used to correct the presented refractive errors and distance vision was finally recorded as best corrected visual acuity. Following the above value until the participant could read the numbers or letters in the line equating to VA of at least 20/40.

A near vision was tested in each eye separately with near-vision reading chart which held at distance of 40 cm.Subjects were asked to used any presented distance corrective eyeglasses or placed corrective trial lens before near vision test. At least correct identification of 3 of 5 characters in each line was identified as a success. The end point of near vision testing was the N8 optotype (1 M or 20/50 Snellen acuity). The N8 optotype was chosen as an end point because it was equivalent to newspaper print at distance of 40 cm. If a subject was unable to read the N8 optotype, spherical plus lenses were added an increment of + 0.25 diopter until the subject read N8 or until additional lenses yielded no further improvement of reading. The visual acuity was repeatedly checked without lens or eyeglasses correction to identified those who have functional presbyopia and record the findings. The power of near vision spectacles was calculated, Ready-made spectacles with power of + 0.75 to + 3.50 diopters (at each step up of + 0.25 diopter) were provided for subjects required plus lenses which required the visual acuity at least of 20/50 or N8 optotype for both eyes. Ready-made spectacles were provided at no cost. Prescriptions and referrals were given to all subjects requiring minus lenses for distance correction.

An inability of reading the N8 optotype at distance of 40 cm with an improvement after correction with additional plus lenses was defined as presbyopia. The degree of presbyopia was determined by the minimum amount of add needed to achieve maximum improvement in line read (to the 20/50 end point). A definition of "functional presbyopia" was used to describe subjects for whom the sum of distance correction and near add resulted in a net plus lens to achieve best near vision[2].

Statistical Analysis

Data were collected on case record forms following study protocol. Statistical analysis was performed using SPSS software version 15.0 and Microsoft excel 2007. Demographic data and power of lens were analyzed by using mean value, standard deviation and percentage. Success rate of presbyopia correction by using ready-made spectacles to achieve the targeted visual acuity (VA) were shown in percentage. Refractive error difference in both eyes which participants failed to correct presbyopia from using ready-made spectacles was recorded and categorized into age, sex and refractive error value for each eye.

Results

In 309 volunteers were 193 females (62.46%) and 116 males (37.54%), which had abnormal eyesight 82 (26.54%), myopia 28 (9.06%), hyperopia 33 (10.68%) and astigmatism 21 (6.80%). Most of the participants (240 volunteers) did not wear eyeglasses. 35 (11.33%) volunteers whose visual acuity less than criteria, 33 (10.67%) previous ophthalmic diseases, which were cataract, glaucoma and others, 3 (0.97%) previous ocular surgery or trauma and 109 (35.72%) volunteers whose gave incomplete information were excluded. 129 of 309 (41.75%) volunteers were enrolled. Table 1 demonstrates that there were 75 (58.14%) females and 54 (41.86%) males. Mean age was 50.71 $\pm$ 8.55 years that aged 51.13 $\pm$ 8.74 years and 50.11 $\pm$ 8.32 years, was female and male respectively which showed no statistical difference, p-value = 0.854.

Discussion

Presbyopia is an age-related condition with

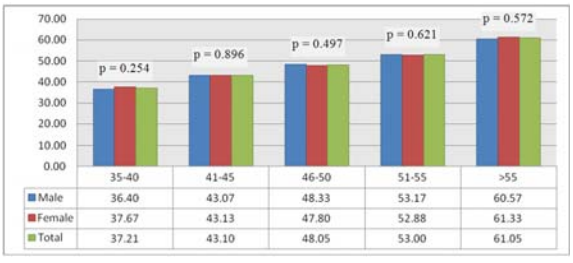

Fig. 1 Show that mean aged distribution of males and females was equally in all age groups.

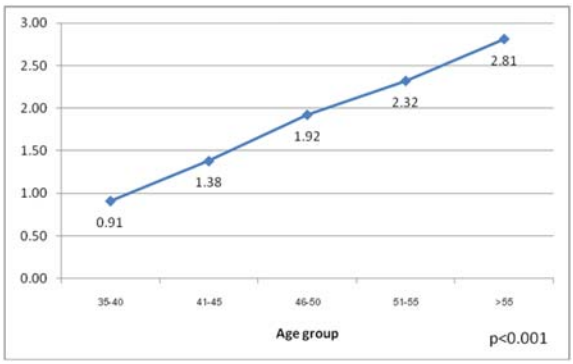

Fig. 2 Relationship of power of additional plus lenses for presbyopia correction and age groups (One way ANOVA, Multiple comparisons test)

loss of lens accommodation that results in an inability to focus at near distance. It is the most common physiological change occurring in the adult eye and is thought to cause universal near vision impairment with advancing age. People who become presbyopia may complain of headaches and eye strain, and hold objects gradually further away from their eyes in order to be able to focus on them which the compensatory mechanism usually limited by the length of the arm. The most common remedy is the prescription of a pair of reading spectacles. Good near vision is important, even among populations who use it for tasks other than reading and writing. The Improved Visual Acuity in Presbyopic with Ready-Made Spectacles in Chachoengsoa, Thailand are not well known. There

Table 1. Demographic data (Chi-Square test)

Age groups (Years)	Total (n = 129)		Male (n = 54)		Female (n = 75)		p-value
	n	%	n	%	n	%	
35-40	14	10.85	5	9.26	9	12.00	0.854
41-45	29	22.48	14	25.93	15	20.00	
46-50	19	14.73	9	16.67	10	13.33	
51-55	29	22.48	12	22.22	17	22.67	
>55	38	29.46	14	25.93	24	32.00	

Table 2. Comparison of power of additional plus lenses for presbyopia correction with age groups (Unpaired t-test)

Age groups (Years)	Total (diopter)	Male (diopter)	Fmale (diopter)	p-value
35-40	0.91 $\pm$ 0.61	1.20 $\pm$ 1.01	0.75 $\pm$ 0.13	0.375
41-45	1.38 $\pm$ 0.14	1.39 $\pm$ 0.13	1.37 $\pm$ 0.16	0.632
46-50	1.92 $\pm$ 0.15	1.94 $\pm$ 0.11	1.90 $\pm$ 0.17	0.522
51-55	2.32 $\pm$ 0.15	2.33 $\pm$ 0.19	2.31 $\pm$ 0.11	0.668
>55	2.81 $\pm$ 0.23	2.86 $\pm$ 0.16	2.78 $\pm$ 0.26	0.273

Table 3. Success rate of presbyopic correction with ready-made spectacles

Age groups (Years)	Total (n = 129)		Male (n = 54)		Female (n = 75)	
	n	% Success	n	% Success	n	% Success
35-40	14	100	5	100	9	100
41-45	29	100	14	100	15	100
46-50	19	100	9	100	10	100
51-55	29	100	12	100	17	100
>55	38	86.84	14	92.86	24	83.33
Total	129	96.12	54	98.15	75	94.67

Table 4. Refractive errors in participants whose failed to correct presbyopic condition with ready-made spectacles.

Age (Years)	Sex	Difference of refractive error (Sphere) in both eyes (Diopter)	Refractive error in each eyes			
			Sphere (Diopter)		Minus cylinder (Diopter)	
			Right	Left	Right	Left
63	Female	+ 2.00	- 0.50	+ 1.50	± 0.00	± 0.00
57	Female	+ 1.75	+ 1.00	+ 2.75	± 0.00	- 1.00
63	Female	+ 1.50	± 0.00	+ 1.50	- 1.00	± 0.00
68	Female	+ 1.25	+ 0.50	+ 1.75	± 0.00	± 0.00
69	Male	+ 1.25	+ 0.25	+ 1.50	- 0.25	- 0.50

were several population-based studies about presbyopia which none of them mentioned about the correction of presbyopic condition with ready-made spectacles. Authors' study in rural Chacheungsao province, can be used to construct a picture of the Ready-Made Spectacles effectiveness in Presbyopic correction in development countries in Southeast Asia. For The authors' study (of people aged 35 and over), we used the N8 optotype (1M or 20/50 Snellen acuity) as the end point of near vision testing. This was selected as it matched the type size for newsprint in the country. We measured near vision by placing the near chart 40 cm away from the subject. We defined people as presbyopic if both of the following were true: they were unable to read the N8 optotype with distance correction in place, if needed they were able to read at least one more line with the addition of a plus lens[2].

In presbyopic patients, the zonules' function is reduced resulting in a reduction in the ability to focus on near objects. This is due to the loss of the ability to adjust lens power leading to the use of spectacles and contact lenses. The zonules' function has a reverse relationship with age, causing the requirement of higher lens power with increasing age[5].

So the degree of presbyopia was determined as the minimum amount of plus lens needed to achieve the maximum improvement in lines read to the end point (N8). A survey of ocular morbidity in rural Ugandan adults found presbyopia to be the most common cause of visual impairment in that country for which treatment was sought. Patients with uncorrected presbyopia accounted for 48 per cent of those presenting with visual impairment[6]. Morny, using hospital chart reviews, found a prevalence of presbyopia equal to 65 per cent in Ghanaian women[7]. In southern India, Nirmalan et al. used the same definition for presbyopia. They found a prevalence of 55 per cent in people aged 30 years and older[1].

Duarte et al in Brazil estimated the prevalence of presbyopia in 3,000 adults of 30 years and older at 55 percent[8]. In the authors' study found 41.75% close to Uganda, Ghanaian, India, Brazil,but a little different because difference in aged and definition. In Brazil who had near vision spectacles, 30 percent had corrections that were ineffective[8]. A total of 58 percent of the sample reported requiring near vision for their routine daily tasks. About a quarter (22.33%) of the people with presbyopia in the authors' study had the spectacles they needed. Only half of Brazil study because in authors' study, we used the N8 optotype (1M or 20/50 Snellen acuity) as the end point of near vision testing different from Brazil.

While new treatments are being developed for presbyopia, spectacles represent an effective, economic option for rural country of Thailand. However, there is little research on the determinants of, and barriers to, the use of near-vision spectacles. Some study suggested that it is very difficult to obtain reading spectacles for persons in rural villages and small towns in Tanzania[3], because majority of people did not know where to get spectacles. Among those who knew where to go, misinformed about where they were available and could not afford to travel to a location where spectacles could be obtained. Lack of knowledge about refractive services, poor accessibility, and additional costs (such as transport) raise further challenges for the authors' study. Result of the authors' study will give the idea of refractive error correction program need to recognition, and community awareness of presbyopia needs to be promoted by using ready-made

spectacles.

In study Tanzania, 92 percent of people with presbyopia was reported using the near-vision spectacles. Almost half of the people used spectacles few times per week that indicate the usefulness the near-vision spectacles in rural Tanzania, where many subjects did not routinely read or write. Better near vision result was reported the improvements in overall quality of life[3].

In southern India, Nirmalan et al showed that a major proportion of people with presbyopia who had spectacles (93%) had obtained their spectacle prescriptions from ophthalmologists, who worked primarily in large cities[1]. In general, assessment and correction of presbyopia require modest expertise and can be undertaken independently of fixed optical services. From two studies have examined the suitability of ready-made spectacles in whites[9,10].

A study of an Australian adult population (age, 40-60 years)[10] reported that 26.8% of subjects had low astigmatic or non astigmatic refractive error and were suitable candidates for ready-made spectacles. The Bangladesh study reported that 29.1% of subjects suitable too[11]. So the ready-made spectacles are effective in correcting presbyopia, low maintenance and cheaper compared to other methods *e.g.* contact lens and surgery same result is author's study.

The authors' study has found that ready-made spectacles are effective in correcting the presbyopia in the age range of 35-55 yrs. However, in the age group of > 55 yrs, the success rate is reduced. Existing difference in refractive error in eyes, cataracts or age-related macula degeneration may be a factor and may require further investigations and alternative treatment.

In the group whose presbyopia cannot be corrected by ready-made spectacles, the study has found that the refractive error was different in each eye. If the spherical refractive errors differ more than 1.25 Diopter, mostly found in females, the ready-made spectacles are ineffective. The cylinder refractive error may be a factor; however, this study only includes patients with astigmatism < 1.0 Diopter. Moreover, the number of patients, whose refractive error cannot be corrected by ready-made spectacles, is too small to indicate any significance. This limitation should be considered in the future study.

Conclusion

Ready-made spectacles are effective in treating presbyopia in all age groups and both sexes in patients from Sanamchaiket Chacheungsao province. In contrast, if the refractive error difference between both eyes is greater than 1.25 Diopter, ready-made spectacles are ineffective.

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ความสามารถในการมองเห็นดีขึ้นจากการแก้ไขภาวะสายตาผู้สูงอายุโดยการใช้แว่นตาสำเร็จรูป จังหวัดฉะเชิงเทรา

ยุทธพงษ์ อิ่มสุวรรณ, ลัทธพล ม้าลายทอง

วัตถุประสงค์ของงานวิจัยนี้เพื่อศึกษาผลสำเร็จของการแก้ไขภาวะสายตาผู้สูงอายุ โดยการใช้แว่นตาสำเร็จรูปในจังหวัดฉะเชิงเทรา โดยมีรูปแบบงานวิจัยเป็น Retrospective cross-sectional analytic study ในอาสาสมัครพื้นที่สนามชัยเขต, จังหวัดฉะเชิงเทรา จำนวน 309 คน ที่มีอายุตั้งแต่ 35 ปี ขึ้นไป และมีภาวะสายตายาวจะได้รับการวัดระดับสายตา และลองใส่แว่นตาสำเร็จรูปที่มีค่าใกล้เคียงกับระดับสายตาที่วัดได้ โดยมีเป้าหมายให้สามารถอ่านตัวเลขหรือตัวอักษรในแถวที่มีค่า visual acuity เท่ากับ 20/50 หรือดีกว่า ผลการศึกษาพบว่าจำนวนผู้ป่วยที่ได้รับการเก็บข้อมูลครบถ้วนเท่ากับ 129 คน พบว่าผู้ป่วยที่มีระดับสายตาอยู่ในระดับเป้าหมาย จากการแก้ไขภาวะสายตาผู้สูงอายุโดยการใช้แว่นตาสำเร็จรูป เท่ากับร้อยละ 96.12 (124 ใน 129 คน) ดังนั้นสรุปว่าการใช้แว่นตาสำเร็จรูปสามารถแก้ไขภาวะสายตาผู้สูงอายุ ในพื้นที่สนามชัยเขต จังหวัดฉะเชิงเทราในระดับเป้าหมายได้ในทุกกลุ่มอายุและทั้งสองเพศ โดยที่ถ้าความแตกต่างของระดับสายตาทั้ง 2 ข้าง แตกต่างกันเกิน 1.25 ไดออปเตอร์ แว่นตาสำเร็จรูปจะไม่มีประสิทธิภาพ