Original Article

Association of Literacy Level with the Perceived Amount of Discomfort Caused by Erroneous Interpupillary Distance Dispensed by Opticians.

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Purpose: To determine the relationship of literacy level with the visual discomfort caused by erroneous interpupillary distance (IPD) dispensed by optician.

Method: A comparative cross-sectional study was conducted among people having symptoms of visual discomfort caused by erroneous IPD of the spectacles. A total of 66 patients having symptoms of discomfort within 1 week to 6 months following glasses' prescription presenting to Mayo hospital Lahore were examined. Interpupillary distance of patient and that of the spectacles were measured by a millimeter PD ruler and Auto-refractometer. Spectacles refractive power was confirmed by Focimeter. Those with accurate spectacle power but wrong centration were included among faulty spectacles. Literacy level of the patient was noted, compared and results were analyzed.

Results: A significant relationship between the symptoms associated with the wrong dispensed interpupillary distance and the literacy level of the patient ($p<0.001$, Chi-square test) was present. Patients complaining of visual discomfort having higher literacy level were greater as compared to that with lower level of literacy. Out of 66 patients with spectacles of erroneously dispensed IPD, 97% patients had higher literacy level ranging Matriculation to graduate level while only 3% were illiterate.

Conclusion: Important dispensing parameters like IPD were commonly ignored by eye care practitioners. Proper optical dispensing with associated patient education is necessary to achieve optimal optical benefits of spectacles and careful attention should be given to this aspect by practitioners.

Keywords: Literacy level, Interpupillary distance (IPD), Discomfort, Dispensing

Introduction

Patients can face a lot of discomfort due to the negligence of the eye care practitioners whether the latter are clinicians or opticians. Sometimes it is the clinician who does not mention the accurate Interpupillary distance values on the prescription card while in other cases it is the opticians who ignore the importance of the interpupillary distance while dispensing the spectacles. They should be careful while prescribing glasses and keep in their mind to mention IPD of the patient, for such purpose there is a continually appraised set of principles for ophthalmic lens dispensing that has been mentioned in The American National Standards Institute. It consists of the precision of the interpupillary distance as evaluated by the clinician or optician.[1] The standard values of interpupillary distance (IPD) are important considerations used in ophthalmic dispensing to design the lenses. In young children corrective glasses are mainly recommended for the management of amblyopia, and it has been proved that improper dispensed glasses will definitely result into damage of vision permanently. The complaints associated with eye due to wrongly dispensed spectacles i.e. asthenopia etc. are decreased to a great extent when the spectacles are dispensed with the suitable IPD.[2]

Interpupillary distance (IPD) is a measurement of the distance between the centers of the pupils and depends upon whether the glasses are prescribed for distance or for close up eyewear. IPD is an essential clinical quantity used to recognize latent vision procedures like stereo acuity,[3] near point convergence,[4] accommodation,[5] and further vision-related matters.[6] Moreover, IPD value plays a central role in the optical manufacturing while preparing appropriate glasses for the patient. IPD is calculated by noting the distance between the centers of the pupils.[7] This distance is measured in millimeters and changes according to the age, gender and race. The statistical distribution of the interpupillary distance (IPD) over a large number of people gives a range of 50-72mm. For the proper alignment of the center of the eyes with the center of the spectacle lens, this measurement of IPD is used. It can lead to refusal of acceptance of the spectacles causing unclear visualization, doubling of objects, distorted images, headaches and eyestrain if the spectacle's centers are not appropriately lined up.[8]

The visual axis (that goes through pupil's center) of the eye coincides with the optical center of spectacles, this phenomenon of falling of axis together is named as centration. If both the centers doesn't fall together in either lens or both and thus achievement of centration is not maintained perfectly, it leads to an inessential prism (induced prism).[9,10] The significant features of optical system like binocular single vision and the 3D image perception are also influenced by the prismatic effect produced as a result of decentration of the eyeglass lenses.[11] Stereopsis is influenced indirectly by several factors that also influence the interpupillary distance. Interpupillary distance clearly defines the binocular disparity of the two images which are fused in the optical center of the brain resulting in 3D perception of image. IPD is a distinct element in stereopsis which can be used for improvement of the stereo acuity of a person. IPD also influence the perceived depth and angular disparity. People having lesser IPD observe more depth than people having greater IPD for a permanent screen disparity and perceiving distance, thus achieve disparity boundaries more quickly.[12]

Literacy is the state of being educated in a specific field or subject. In a survey of Pakistan Bureau of Statistics it was recorded that one-third of the Pakistani population acquired education equal to primary level and only 20% had middle school education with men dominating over women. Emphasizing the state of education in our country, Pakistan was rated 113 out of 120 in the Education development index, documented in the survey of United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2012.[13] At present Pakistan's population is exceeding 190 million. For centuries, in both progressing and industrial nations, the people deprived of health knowledge don't pay enough attention on the use of their medicine, wearing the accurate glasses and they are also not willing to accept the nature of treatment neither do they return back to their doctor for follow up. This leads to the fact that literate people can distinguish problem and associated discomfort more quickly than the illiterate ones. Illiteracy is commonly related to lack of disease awareness.[14]

Methodology

Ethical clearance to conduct the study was obtained from the College of Ophthalmology and Allied Vision Sciences, King Edward Medical University Lahore. A comparative cross sectional study design was utilized. From a study population of patients at Mayo hospital eye OPD refractive clinic, a study sample of 66 patient wearing spectacles with correct refractive correction but wrong IPD were selected. The participants with strabismus and other ocular pathology were excluded from the study. A consent form in English containing information relating to the purpose, significance and intended procedures of the research study was completed and signed by each participant. A Performa providing information on their highest literacy level, type of refractive error, refractive state of eye, ocular complaints, IPD of the patient and that of the spectacle was measured and completed by the researcher.

Data was analyzed using SPSS Version 20.The relationship of literacy level and the visual discomfort associated with wrongly dispensed IPD was derived from the data. A comparative cross section study was done using the Chi square Test, with a probability of $p<0.05$ to correlate the

participant's symptoms and the literacy level as well as to correlate the highest literacy level to the difference between IPD of the spectacles and that of the patient. To maintain confidentiality the use of a code rather than the participant's name was employed.

Results

There were total 66 subjects consisting of 2(3%) illiterates, 4(6.1%) with primary education, 6(9.1%) with middle education, 10(15.2%) with Matriculation, 17(25.8%) with Higher secondary education, 18(27.3%) Graduated, 7(10.6%) with post graduate education and 2(3%) others (Hafiz Quran).

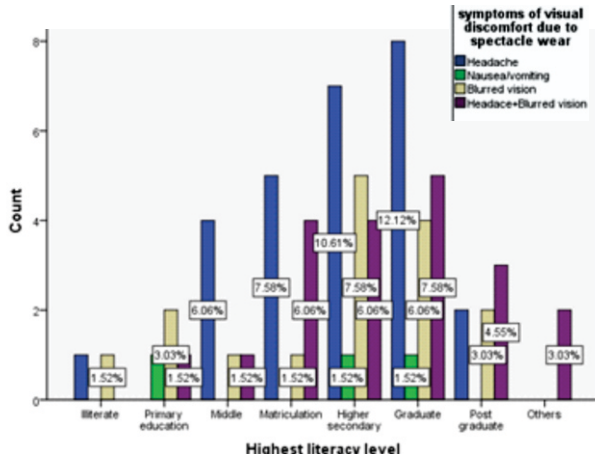
Table 1: Difference in IPD of the spectacles and that of patient.

IPD Inaccuracy (mm)	Frequency	Percent
- 10	1	1.5
- 7	5	7.6
- 6	9	13.6
- 5	4	6.1
- 4	11	16.7
- 3	3	4.5
- 2	1	1.5
3	3	4.5
4	12	18.2
5	6	9.1
6	7	10.6
7	1	1.5
8	1	1.5
9	1	1.5
10	1	1.5
Total (N)	**66**	**100**

Table 2: Literacy level of the subjects.

Literacy level				
Highest literacy	**Observed N**	**Expected N**	**Residual**	**P-value**
Illiterate	2	8.3	-6.3	.000
Primary education	4	8.3	-4.3	.000
Middle	6	8.3	-2.3	.000
Matriculation	10	8.3	1.8	.000
Higher secondary	17	8.3	8.8	.000
Graduate	18	8.3	9.8	.000
Post graduate	7	8.3	-1.3	.000
	2	8.3	-6.3	.000
Total (N)	66			

Fig 1: Highest literacy of patient*Associated symptoms of discomfort



The numbers of literate subjects are considerably greater than that of illiterates. Chi-Square test statistics illustrates that the relationship of literacy level to the patients with spectacles of erroneous IPD is highly significant as p-value is .000 ($p<0.05$) in Table.2.

A significant association is present between the literacy of patient and the associated symptom of discomfort ($p=.000$ which is less than 0.05) in figure 1. The subjects with literacy level of Matriculation, Higher secondary and Graduation were complaining the most.

Discussion

It is a fact that frequently majority of people does not pay attention whether all the essential parameters for spectacle dispensing are given in a prescription or not due to

lack of knowledge and education. The reason for this is that they don't know about the importance of dispensing in opticianry. A small error in spectacle dispensing greater than the adaptation limit can cause a massive amount of discomfort for the wearer. There are studies which illustrates how often these mistakes are made while dispensing the spectacle and does not reach up to the level as they are prescribed. Unless a patient tells about the discomfort due to spectacles wear, the optometrist or clinician assumes that the patient using the spectacles has been dispensed as the glasses are prescribed. Likewise, the patients while collecting glasses from the dispenser frequently do not enquire for confirmation as they believe that the glasses have been dispensed accurately. There are around one-third of the patients who did not inquire the optician to confirm the dispensed glasses, and thus had erroneous glasses. This illustration is supported by the study of Kanwar and Ashok.[15]

Our research was intended to find the association between literacy of the patient and symptoms of visual discomfort caused by erroneously dispensed interpupillary distance of the spectacles. It was conducted to note whether the misalignments of the interpupillary distance (IPD) and its associated visual discomfort has a significant influence on the education of patient. From the research we found out a significant relationship between the symptoms associated with the inaccurately dispensed IPD by the optician and the literacy level of the patient (p=.000). Moreover we demonstrated that those patients with lower literacy level or illiterates do not return to complain for their related symptoms of erroneous dispensing while patients with higher literacy level were aware of their visual discomfort and return back complaining of inaccuracy in their spectacles. These results supported the study of Kickbusch which showed that the lack of disease awareness was frequently linked with illiteracy of the patient.[16]

Regardless of the fact that a great number of the patients' spectacles gave the impression to suit accurately on the naked eye observation, when confirmed by measurements, a clinically considerable numbers of subjects were not looking through the optical center of their lenses which meant their spectacles were inappropriate. This could be avoided by providing good patient education and also by the practitioners confirming appropriate placement through the dispensing of the glasses and which was usually not always completed by the practitioners. The wrong dispensed spectacles in this study gave rise to all patients exposing a definite amount of induced prism, while agreeing to Osubeni, the patients may go through symptoms of visual discomfort such as asthenopia and blurred vision.[17] Topliss also supported this result while stating that centration is imperative with current large sizes of lenses otherwise the spectacle wearer will have to get over the unnecessary prismatic effect in order to observe the object clearly. This may lead to comfortless vision and headaches in certain cases.[18]

This study also demonstrates that there is no significant relationship of the difference present between the IPD of the spectacles and that of the patient, to the highest literacy level of patient and symptoms of visuals discomfort caused by erroneous dispensed IPD. To our best knowledge, unfortunately there is no study done before on this relation.

Conclusion and Recommendations

This study proved that important dispensing parameters like IPD are commonly ignored by the eye care practitioners. Proper optical dispensing with associated patient education is necessary to achieve optimal optical benefits of spectacles and careful attention should be given to this aspect by practitioners. Recommendations for further study will be that other comparable studies on the larger level must be directed within different population for extensive examining of the condition in the country. A national data base about misalignment of interpupillary distance should be organized following this programed.

Eye care practitioners should mention the spectacle parameters like IPD on the prescription and confirm the centration as well as proper frame fitting after dispensing of spectacle. It is therefore suggested that patients should return periodically to their clinician or optometrists for the assessment of the frame alignment and should be adjusted if needed.

Eye care practitioners should also educate their patients about these important parameters of IPD and centration so that they may have an eye on accurate dispensing and do not face any inconvenience about the spectacles.

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