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RELATIONSHIP BETWEEN VISUAL IMPAIRMENT AND IQ PARTICULARLY AMONG MEDICAL STAFF.

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Abstract:

Objective: *This study aims to determine the relationship between visual impairment and IQ in medical staff.* ***Methodology:*** *This was a cross-sectional study conducted among medical staff in Saudi Arabia. Data was collected using a predesigned questionnaire.* ***Results:*** *Out of the 142 participants, 74.6% were females and 95.8% were Saudi. More than half of the respondents (54.9%) were medical students and 23.2% were physicians. 49.3% of them had a history of visual symptoms. Of the visually impaired individuals, 57.2% had blurred vision and 25.7% were myopic. Study demonstrated a significant association between age (P=0.038) and professional title (P=0.001) and the IQ mean rank.* ***Conclusion:*** *This study found no significant association between visual impairments and IQ score among the medical participants. There is also a small amount or no focus on the articles and/or researches that assess the intelligence among visually impaired people in Saudi Arabia. Medical students and physicians were found to have higher IQ mean ranks.*

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INTRODUCTION:

The visual system is distinguishable in its capability of receiving light waves from the environment, focus it into the retina and send a signal to be processed into the brain. Disturbances in this system results in visual impairment [1]. Visual impairments comprise low vision or blindness and point out to any degree of impairment that affects the individual's life. Blindness refers to complete loss of vision, however, the term is usually used to refer to sever visual impairment that in turn causes a requirement for essentially using nonvisual sensory information. Low vision direct the attention to less critical cases of visual impairments, yet the individual with low vision still has improper ability to achieve daily activities and they need to utilize tools and techniques to reinforce this ability with their limited vision [2].

Numerous epidemiological studies have established that visual impairment is accompanied by reducing quality of life, depressive disorders, falls and decreased physical activity [3-5]. The international classification of diseases in 2018 has classified vision impairment into two sets, distance and presenting vision impairment. The distance vision impairments is subcategorized into (mild, moderate, severe and blindness) [6].

The recent estimates by WHO has established that throughout the world, there are 1 billion people have visual impairment that could be prevented or yet to be addressed [7]. Additionally, the distance vision impairment prevalence is four times higher in low- and middle-income areas than in high-income areas [8]. Unaddressed near vision impairment rates are ranking with more than 80% in Western, Eastern and central sub-Saharan Africa, whereas, relative rates in high-income areas of North America, Australasia, Western Europe, and Asia-Pacific are estimated to be less than 10% [9].

Visual impairment is also prevalent among a large scale of adults [10], and a number of studies have reported relations between decreased visual acuity and poor cognitive function [11, 12]. Maćesić-Petrović et al [13], conducted a descriptive study to assess the cognitive development among 79 children with visual impairment and held tasks included elementary operation of classification, seriation, task by correspondence. They found that exactly 54.9% of the children were able to resolve the classification task in accordance with the standards of size and shape. Moreover, 9.9% of the sample were capable of dealing with figural collections. In conclusion, their results have pointed to the disturbances in the visual functioning which facilitates the process of conversations of mass to be improved regardless the sort of visual disorder. They also suggested that the level of general intellectual functioning should be controlled among this group of children [14].

Campos et al [15], also conducted a study based on an intelligence scale among children with visual impairment by type and degree of disability, and found that most of the assessed areas did not reveal any significant difference among the groups, with a better performance among those with congenital defects. Another study has evaluated the IQ among and its association with myopia among children, and reported that children who ranked with higher nonverbal IQ had significantly more myopic refractive errors. They also reported an interesting observation that stated that the nonverbal IQ could be a robust risk factor for myopia in comparison with reading books per week [16].

A population-based cross-sectional study was conducted in Singapore, among 1179 participants aged from (60-80 years) to investigate the association between visual impairments, age-related eye diseases and cognitive function. The study found that elder individuals with visual impairments, particularly cataract, were more vulnerable to have cognitive dysfunction. Additionally, regarding the major age-related eye diseases, at most diabetic retinopathy was related to cognitive dysfunction [17].

Various mechanisms have been explained the association between visual impairment and decline in cognitive function. First, these two factors; visual impairment and decreasing cognitive function, are both associated with aging [18, 19]. The latter implies that visual impairment could be related to the decreasing frequency of daily activities and capability of performing brain-stimulating activities, including reading and seeing faces [20].

Interestingly, studies in this topic have uniformly shown the association between myopia and the increasing IQ scores and enhancing school achievement among children [21, 22]. Depending on previous researches throughout the world, Karlsson et al. [23], conducted a study in California the adopted the following hypotheses, since high levels of intelligence is thus the prime sign of the existence of the mutant gene, the superior leading hypothesis sounds to be that the myopia gene in a homozygous state generates both brain stimulation and lengthening of the eye ball.

As most of the previous international studies had various and conflicting results, and as far as we know, this is the first population-based study in Saudi Arabia that aims to assess the association between visual impairment and IQ.

METHODOLOGY:

Aim:

To determine the relationship between visual impairment and IQ among medical staff.

The sub- objectives:

1- To determine how many people from the medical staff have vision impairment.
2- Determining the prevalence of visual impairment.
3- Determining the interest in following up the eyesight test.
4- Determine the IQ associated with visual impairment.
5- To see how true (the medical staff is smarter than other disciplines).

Method and design:

Study design and setting:

This was a cross sectional study conducted in the Kingdom of Saudi Arabia.

Study population:

Medical staff in the kingdom of Saudi Arabia

Inclusion criteria:

Medical staff.

Exclusion criteria:

Non-medical staff.

Data collection methods:

Data collection tool:

Predesigned self-administered questionnaire partially constructed by the researcher with reference to already made questionnaire in another study Validity was checked by a consultant. The first part included the socio-demographic data of the participants (Gender, age, nationality and professional title). The second part included the history and type of visual symptoms, wearing glasses or contact lenses and visual acuity. The third part comprised IQ test [24].

Sample size:

142 participants

Data entry and statistical analysis:

The data was entered into a personal computer and it was analyzed using Statistical Package for the Social Sciences (SPSS) version 26 [25].

Ethical consideration:

Study objectives were explained to the participants, individual consent from participants (written on the front page of the questionnaire) and all data was kept confidential.

RESULTS:

Table (1) presents the socio-demographic characteristics of 142 participants. Out of the total population, 74.6% were females and 65.5% aged from (18-25 years). The vast majority of them (95.8%) were Saudi. More than half of the participants (54.9%) were medical students, 23.2% were physicians, 12.7% were from the nursing staff, 3.5% were pharmacy students, 3.5% were physiotherapist and 2.1% were pharmacists. 49.3% of the participants had history of visual symptoms and regarding the type of these visual symptoms, 57.2% had blurred vision, 25.7% had myopia, 5.7% had hypermetropia, 5.7% had visual field defects and 5.7% had other visual impairments. Approximately, 47.2% of them were wearing glasses or contact lenses. Less than half of the participants (45.1%) had their last optometry about more than 18 months ago and 23.2% had it within the last 6 months. As for the visual acuity of the participants, 33.1% were reported to have the normal visual acuity equal to (6/6), 21.1% were equal to (5/6), 11.3% recorded visual acuity of (4/6) and 26.8% did not know what is their visual acuity determination.

Table (2) details the associations between sex, age, title, history of visual symptoms and visual acuity with IQ test mean ranks. Age was found to be statistically significant with IQ test (P=0.038), as the participants aged over 40 years and from (18-25 years) recorded the highest IQ results with mean rank of (80.08) and (76.34), respectively. We also found a significant association between the professional title and IQ level (P=0.001), as the medical students (82.57) and physicians (69.89) ranked the highest results, while the Nursing staff (42.11) and pharmacists (34.67) recorded the lowest results. Nevertheless, the history of visual symptoms, last optometry, wearing glasses or contact lenses and visual acuity did not demonstrate any significant associations with IQ test with (P=0.768), (P=0.851), (P=0.740) and (P=0.202), respectively.

Table (1): Description of Socio-demographic characteristics of the participants (N=142)

Parameter	Frequency	Percent
Gender		
• **Male**	36	25.4%
• **Female**	106	74.6%
Age group		
• **18-25**	93	65.5%
• **26-32**	23	16.2%
• **33-40**	13	9.2%
• **Over 40 years**	13	9.2%
Nationality		
• **Saudi**	136	95.8%
• **Non-Saudi**	6	4.2%
Professional title		
• **Medical student**	78	54.9%
• **Nursing**	18	12.7%
• **Pharmacists**	3	2.1%
• **Pharmacy student**	5	3.5%
• **Physician**	33	23.2%
• **Physiotherapist**	5	3.5%
History of visual symptoms		
• **Yes**	70	49.3%
• **No**	72	50.7%
Visual symptoms		
• **Blurred Vision**	40	57.2%
• **Hypermetropia**	4	5.7%
• **Myopia**	18	25.7%
• **Visual field defects**	4	5.7%
• **Others**	4	5.7%
Wearing glasses or contact lenses		
• **Yes**	67	47.2%
• **No**	75	52.8%
Last optometry		
• **Within 6 months**	33	23.2%
• **6-12 months**	21	14.8%
• **12-18 months**	24	16.9%
• **More than 18 months**	64	45.1%
Visual acuity		
• **1/6**	1	0.7%
• **2/6**	4	2.8%
• **3/6**	6	4.2%
• **4/6**	16	11.3%
• **5/6**	30	21.1%
• **6/6**	47	33.1%
• **I don't know**	38	26.8%

Table (2): Association between sex, age, title, history of visual symptoms, and visual acuity with IQ test mean ranks (N=142)

Parameter		IQ Test Mean rank	P-value
Sex	• **Male**	78.39	0.243*
	• **Female**	69.16	
Age	• **18-25**	76.34	**0.038****
	• **26-32**	61.83	
	• **33-40**	45.38	
	• **Over 40 years**	80.08	
Professional title	• **Medical student**	82.57	**0.001****
	• **Nursing**	42.11	
	• **Pharmacists**	34.67	
	• **Pharmacy student**	65.30	
	• **Physician**	69.89	
	• **Physiotherapist**	43.50	
History of visual symptoms	• **Yes**	72.53	0.768*
	• **No**	70.50	
Last optometry	• **Within 6 months**	68.58	0.851**
	• **6-12 months**	77.31	
	• **12-18 months**	74.40	
	• **More than 18 months**	70.02	
Wearing glasses or contact lenses	• **Yes**	72.71	0.740*
	• **No**	70.24	
Visual acuity	• **1/6**	10.50	0.202**
	• **2/6**	53.00	
	• **3/6**	71.83	
	• **4/6**	57.16	
	• **5/6**	65.90	
	• **6/6**	81.78	
	• **I don't know**	72.75	

***Mann-Whitney U test was used**
**** Kruskal Wallis Test was used**

DISCUSSION:

This was a cross-sectional study conducted among the Saudi medical staff to determine the association between the visual impairment and IQ level. The study included 142 participants including medical and pharmaceutical students and medical staff. Of the total sample, 49.3% had a history of visual symptoms, 57.2% of the visually impaired sample had blurred vision and 25.7% had myopia.

The present study demonstrated a significant association between age and IQ mean rank (P=0.038), as elder (over 40 years old) and younger (18-25 years) recorded the highest IQ means with (80.08) and (76.34), respectively. Professional title was also significantly associated with IQ score (P=0.001). The medical students and physicians ranked with the highest mean scores (82.57) and (69.89), respectively.

Our results did not find a significant association between the history of visual symptoms and IQ score (P=0.768), as the population who had a history of visual impairment (72.53) relatively scored the same IQ mean rank of the population who did not suffer any visual impairments (70.50). However, it has been observed in different studies that conducted in the United States, New Zealand and Israel that children with myopia have higher IQ scores [21, 26-28].

Rosener et al [26], used computerized data to estimate the rates of myopia among 157,748 young adult males with different educational levels and in intelligence groups. The study found that 15.8% of the sample had myopia and there was a strong association between myopia and the intelligence level. Young et al [29], used the nonverbal Stanford Binet Intelligence and supported our results as they found that there is no significant association between refractive error and intelligence.

Dekker et al [30], conducted a study among 155 visually impaired child living in Netherlands and Belgium to evaluate the associations between the visual measures and intelligence subsets. They found that visual characteristics were significantly inter-related with intelligence. The explanation for the relationship between myopia and higher IQ is insufficient, although it has been hypothesized that there is a relation between the axial lengthening of the eyeball and the cerebral development, or that myopia and IQ are both influenced by the same genes [27, 30].

Moreover, some other population based studies [13, 17-19], demonstrated that among population-based samples of adults and elder people, visual impairment was associated with decreasing in the cognitive function over time and aggravating of vision has a stronger association with decreasing the cognitive function. Two theories have been suggested to interpret the relationship between visual impairment and the decreasing cognitive function in older adults. The first hypothesizes that visual impairment affects cognitive function by influencing activities that this population participate in (the sensory loss consequence theory) [31]. The latter hypothesis is that visual impairment and the decreasing cognitive function are both a result from a common source that causes infection, inflammation or deterioration of central nervous function [19].

CONCLUSION:

This study found no significant association between visual impairments and IQ score among the medical participants. We also noticed that there is a small amount or no focus on the articles and/or researches that assess the intelligence among visually impaired people in Saudi Arabia. Medical students and physicians were found to have higher IQ mean ranks. Additionally, the elder group were the most intelligent participants in the sample.

REFERENCES:

1. Freeman, E. E., & Gower, E. W. (2013). Visual Impairment. In Women and Health (pp. 1463-1472). Elsevier Inc..
2. ScienceDirect. Visual Impairments, International Encyclopedia of Education (Third Edition), 2010. Available at: https://www.sciencedirect.com/topics/nursing-and-health-professions/visual-impairment [accessed on 9 November 2020].
3. Rahi, J. S., Cumberland, P. M., & Peckham, C. S. (2009). Visual impairment and vision-related quality of life in working-age adults: findings in the 1958 British birth cohort. Ophthalmology, 116(2), 270-274.
4. Swanson, M. W., Bodner, E., Sawyer, P., & Allman, R. M. (2012). Visual acuity's association with levels of leisure-time physical activity in community-dwelling older adults. Journal of aging and physical activity, 20(1), 1-14.
5. Freeman, E. E., Egleston, B. L., West, S. K., Bandeen-Roche, K., & Rubin, G. (2005). Visual acuity change and mortality in older adults. Investigative ophthalmology & visual science, 46(11), 4040-4045.
6. Naipal, S., & Rampersad, N. (2018). A review of visual impairment. African Vision and Eye Health, 77(1), 1-4.

7. WHO. Blindness and vision impairment. 2020. Available at: https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment [accessed on 9 November 2020].
8. Bourne, R. R., Flaxman, S. R., Braithwaite, T., Cicinelli, M. V., Das, A., Jonas, J. B., ... & Naidoo, K. (2017). Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. The Lancet Global Health, 5(9), e888-e897.
9. Fricke, T. R., Tahhan, N., Resnikoff, S., Papas, E., Burnett, A., Ho, S. M., ... & Naidoo, K. S. (2018). Global prevalence of presbyopia and vision impairment from uncorrected presbyopia: systematic review, meta-analysis, and modelling. Ophthalmology, 125(10), 1492-1499.
10. Congdon, N., O'Colmain, B., Klaver, C. C., Klein, R., Muñoz, B., Friedman, D. S., ... & Mitchell, P. (2004). Causes and prevalence of visual impairment among adults in the United States. Archives of Ophthalmology (Chicago, Ill.: 1960), 122(4), 477-485.
11. Reyes-Ortiz, C. A., Kuo, Y. F., DiNuzzo, A. R., Ray, L. A., Raji, M. A., & Markides, K. S. (2005). Near vision impairment predicts cognitive decline: data from the Hispanic Established Populations for Epidemiologic Studies of the Elderly. Journal of the American Geriatrics Society, 53(4), 681-686.
12. Lin MY, Gutierrez PR, Stone KL, et al; Study of Osteoporotic Fractures Research Group. Vision impairment and combined vision and hearing impairment predict cognitive and functional decline in older women. J Am Geriatr Soc. 2004;52 (12):1996-2002.
13. Maćesić-Petrović, D., Vučinić, V., & Eškirović, B. (2010). Cognitive development of the children with visual impairment and special educational treatment. Procedia-Social and Behavioral Sciences, 5, 157-162.
14. Rothbart, M. K., & Posner, M. I. (2006). Educating the human brain.
15. Campos, C. R., & de Cássia Nakano, T. (2018). Intelligence Scale for children with visual impairment-professional version: performance by type and degree of disability. REXE-Revista de Estudios y Experiencias en Educación, 17(33), 31-44.
16. Saw, S. M., Tan, S. B., Fung, D., Chia, K. S., Koh, D., Tan, D. T., & Stone, R. A. (2004). IQ and the association with myopia in children. Investigative ophthalmology & visual science, 45(9), 2943-2948.
17. Ong, S. Y., Cheung, C. Y., Li, X., Lamoureux, E. L., Ikram, M. K., Ding, J., ... & Chen, C. P. (2012). Visual impairment, age-related eye diseases, and cognitive function: the Singapore Malay Eye study. Archives of ophthalmology, 130(7), 895-900.
18. Salthouse, T. A., Hancock, H. E., Meinz, E. J., & Hambrick, D. Z. (1996). Interrelations of age, visual acuity, and cognitive functioning. The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 51(6), P317-330.
19. Fischer, M. E., Cruickshanks, K. J., Schubert, C. R., Pinto, A. A., Carlsson, C. M., Klein, B. E., ... & Tweed, T. S. (2016). Age-related sensory impairments and risk of cognitive impairment. Journal of the American Geriatrics Society, 64(10), 1981-1987.
20. Vu, H. T. V., Keeffe, J. E., McCarty, C. A., & Taylor, H. R. (2005). Impact of unilateral and bilateral vision loss on quality of life. British journal of ophthalmology, 89(3), 360-363.
21. Grosvenor, T. (1970). Refractive state, intelligence test scores, and academic ability. American Journal of Optometry & Archives of American Academy of Optometry.
22. Scholz, D. (1970). Die Beziehungen zwischen Myopie und Schulerfolg, Wachstum und sozialen Faktoren. Öff Gesundheitswesen, 32, 530-535.
23. Karlsson, J. L. (1975). Influence of the myopia gene on brain development. Clinical genetics, 8(5), 314-318.
24. Methodology 1
25. Methodology 2
26. Rosner, M., & Belkin, M. (1987). Intelligence, education, and myopia in males. Archives of ophthalmology, 105(11), 1508-1511.
27. Hirsch, M. J. (1959). The relationship between refractive state of the eye and intelligence test scores. Optometry and Vision Science, 36(1), 12-21.
28. Douglas JW, Ross JM, Simpson HR. The ability and attainment of short-sighted pupils. J R Statist Soc A. 1967;130:479–504.
29. Young, F. A. (1963). Reading, measures of intelligence and refractive errors. Optometry and Vision Science, 40(5), 257-264.
30. Dekker, R., & Koole, F. D. (1992). Visually impaired children's visual characteristics and intelligence. Developmental Medicine & Child Neurology, 34(2), 123-133.
31. Storfer, M. (1999). Myopia, intelligence, and the expanding human neocortex: Behavioral influences and evolutionary implications. International Journal of Neuroscience, 98(3-4), 153-276.

32. Verghese, J., LeValley, A., Derby, C., Kuslansky, G., Katz, M., Hall, C., ... & Lipton, R. B. (2006). Leisure activities and the risk of amnestic mild cognitive impairment in the elderly. Neurology, 66(6), 821-827.