Original Article

Association of Socio-Economic Status and Visual Impairment: A Population-Based Study in Iran

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Abstract

Backgrounds: To assess the role of socio-economic inequality in visual impairment (VI) in Varamin district, Iran.

Patients and Methods: Using multistage cluster sampling method, 60 clusters (each with 50 subjects) were recruited and underwent clinical eye examinations. Socio-economic status (SES) was identified based on education, occupation, family assets and housing conditions that were measured at the participants' households using a semi-structured questionnaire and a two-step cluster analysis model. In addition, principal component analysis and the concentration index were used to identify the gap between high and low SES groups.

Results: Participants were categorized in high (522, 24.4%), moderate (974, 43.1%) and low (763, 33.7%) socio-economic levels. In these levels, the prevalence of VI was 5.9% (95% CI: 3.3 to 8.6), 10.4% (95% CI: 8.4 to 12.4), and 12.6% (95% CI: 10.1 to 15.1), respectively. The prevalence of VI in people with low SES was significantly greater than those in high SES level. The proportions of avoidable causes were relatively high in all SES levels (more than 80%) with no significant difference between different levels.

Conclusions: There is significant inequality in VI prevalence in Varamin district. Avoidable causes are high in all SES groups. Therefore, community-based modalities and preventive programs with a specific notice to poorer SES groups are recommended to improve eye health in this district.

Keywords: Iran, population-based study, socio-economic status, visual impairment

Cite this article as: Katibeh M, Rajavi Z, Yaseri M, Hosseini S, Hosseini S, Akbarian S, Sehat M. Association of socio-economic status and visual impairment: A population-based study in Iran. *Arch Iran Med.* 2017**; 20(1):** 43 – 48.

Introduction

The majority of blind and visually impaired people live in developing countries and suffer from preventable or curable causes.[1] Blindness, as a disability, increases the rate of unemployment, poverty, and hunger and limits access to education and other opportunities. Due to the productivity loss and other direct and indirect costs, the financial burden of blindness for individual and society is considerable.[2–4]

Taking the global distribution of visual impairment (VI) into consideration, it is apparent that visual problems are more prevalent in poorer countries. In other words, lack of economic development in a community is an underlying factor of VI.[2] In addition, it is estimated that the prevalence of blindness in low- and middle-income countries is nearly several times greater than high-income countries.[5,6] However, social and economic factors at individual and household levels that may lead to VI and blindness have not been broadly investigated. For instance, people clustered in poor communities have less access to health care resources. Nevertheless, it has been shown that even if available and affordable eye care services are provided, people with poor economic status still do not utilize health services properly.[7] Therefore, a combination of socioeconomic indicators like education, occupation, and wealth, particularly at individual level, might better account for the relationship between socioeconomic status (SES) and eye health status.[8]

In Varamin, published reports have fairly described the epidemiology of VI and eye care needs and resources.[9–11] The current study aims to identify the association of SES and blindness in this area that can be used for eye health planning and resource allocation. Previously, Emamian, et al. have reported a three times higher prevalence of VI among people with low SES in comparison with those in high SES in Shahroud.[12] Hashemi, et al. have also revealed that cataract surgical rate (CSR) in some areas of Iran is mainly attributed to the economic status of inhabitants in a region.[13] It should be mentioned that CSR is an indicator of eye care service delivery, access and utilization. Therefore, it seems that there are inequalities in eye care services/utilization and it is worthwhile to conduct further studies in other parts of the country to reveal the role of social and economic determinants and eye health inequalities.

Methods

This population-based cross-sectional study was conducted on an Iranian population over 50 years of age living in rural and urban areas of Varamin district, located in southeast of Tehran province.

Ethical Issues

The study adhered to the tenets of the Declaration of Helsinki

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Accepted for publication: 23 November 2016

and was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences. Prior to enrollment, all patients were informed about the goals and procedures of the study, and written informed consent was obtained from all participants.

Sampling

The prevalence of blindness in older adults (≥ 50 years) in the Middle East has been estimated at 5.6%.[5] Considering this prevalence with a 95% confidence interval (CI), a maximum error of 1%, 10% nonresponsive and an expected design effect of 1.7, a sample size of 3,000 individuals was calculated.

To choose clusters, the number and location of all enumeration blocks of the Varamin district were obtained from the National Statistical Office (NSO). Iranian Population and Housing Census in 2006 was the source of age and sex information. Then, 60 clusters were selected with a probability proportionate to size and systematic random method. In each cluster, all families with at least one member aged over 50 years were included with a compact segment sampling method. Sampling continued until 50 eligible individuals entered the study in each cluster. More details of study methods and the comparison between the selected samples and the district population have been previously published.[9]

Eye Examinations

Eye examinations were based on rapid assessment of avoidable blindness (RAAB) protocol.[14] According to this protocol, all participants were visited by trained optometrists at their homes. The optometrist identified visual acuity and lens status by a tumbling E chart and a direct ophthalmoscope. Then, in cases with a visual acuity of worse than 6/18 in either eye, an ophthalmologist visit was arranged and slit lamp biomicroscopy and direct ophthalmoscopy were performed through dilated pupil. The ophthalmologist identified the main causes of VI.

Socioeconomic Status

SES was measured by a semi-structured questionnaire at individual and household levels. The questionnaire included 38 questions on occupation, education, family assets, and housing conditions. The order of questions was such that individuals were questioned about demographic data first, and then education, family assets and housing conditions were successively recorded.

To evaluate family assets, the annual list of asset ownership provided by the NSO of Iran was obtained and the following items linked to SES and study context were chosen by an expert panel: number of rooms available to each household, ownership of property and farm lands, livestock, cars, motorcycles, furniture, color TV, microwave oven, washing machine and dish washer, internet, computer and mobile phones.

SES questionnaires were completed by two local health workers at participants' homes. The health workers asked the participants the questions and simultaneously controlled some assets to check the validity of answers. Before data collection, the interviewers were trained about interview methods and study protocols to improve the accuracy of data collection.

Definitions

The visual impairment (VI) definitions were based on visual acuity (VA) in the better eye with presenting correction and categorized to blindness (V.A < 3/60), severe visual impairment (SVI) (3/60 ≤ V.A < 6/60) and moderate visual impairment (MVI) (6/60 ≤ V.A < 6/18) as defined by the World Health Organization. In addition, VI was reported based on best corrected visual acuity (BCVA).

Statistical Analysis

In order to categorize subjects in various SES levels, a two-step cluster analysis was employed. In addition, to obtain the concentration curve, we computed the score of SES with principal component analysis. This score was used to calculate the decomposing difference between the higher and lower third section of SES in terms of VI using Neumark decomposition index method.[15] To compare demographic and socioeconomic characteristics among different SES levels and to find the possible correlation of these items with SES level, Spearman correlation, Mann-Whitney, and Kruskall-Wallis tests were used. In all comparisons, the correlation of outcomes among clusters (design effect), family members and individuals (when two eyes were explored) were considered through multilevel analysis. Statistical analysis was performed using SPSS (version 21.0, IBM Co. Chicago, IL).

Results

In this study, 2,259 participants with a mean age of 60.9 ± 9.5 years underwent both ophthalmic examinations and SES evaluation (response rate: 75.3% of eligible samples); among them, 1,011 (44.8%) were men.

The concentration curve (Figure 1) showed SES inequality in VI in Varamin district; VI was more prevalent in people with poorer SES.

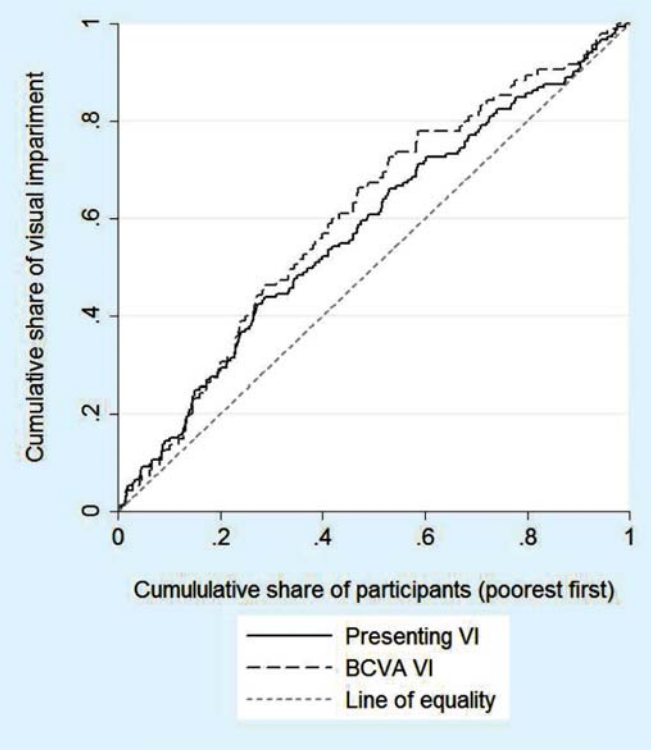

Figure 1. Concentration curve based on principal component analysis

Based on the two-step cluster analysis, the subjects were categorized in three groups; high, moderate and low socioeconomic levels. To verify the results of two-step cluster analysis for distinguishing the levels of SES, we compared some major indicators among three SES

Table 1. Relationship between demographic and socio-economic variables and predicted socio-economic status based on two-step cluster analysis

	Socio economic status				*P*
	Total	Low (N = 763)	Moderate (N = 974)	High (N = 522)	
Individual level					
Age					< 0.001*
Mean ± SD	60.9 ± 9.5	62.2 ± 9.8	61.2 ± 9.8	58.5 ± 8.1	
Median (range)	58 (50 to 110)	60 (50 to 110)	59 (50 to 96)	56 (50 to 92)	
Sex					< 0.001†
Male	1011 (44.8%)	307 (40.2%)	446 (45.8%)	258 (49.4%)	
Female	1248 (55.2%)	456 (59.8%)	528 (54.2%)	264 (50.6%)	
Education					< 0.001*
Illiterate	1234 (54.7%)	568 (74.4%)	556 (57.2%)	110 (21.2%)	
1–5	693 (30.7%)	156 (20.4%)	331 (34.1%)	206 (39.7%)	
6–11	203 (9.0%)	34 (4.5%)	70 (7.2%)	99 (19.1%)	
12	98 (4.3%)	4 (0.5%)	14 (1.4%)	80 (15.4%)	
> 12	26 (1.2%)	1 (0.1%)	1 (0.1%)	24 (4.6%)	
Marriage status					< 0.001*
Married	1748 (77.5%)	519 (68.1%)	774 (79.5%)	455 (87.5%)	
Widow	481 (21.3%)	228 (29.9%)	192 (19.7%)	61 (11.7%)	
Separated + single	27 (1.2%)	15 (2.0%)	8 (0.8%)	4 (0.8%)	
Language					< 0.001‡
Farsi	1428 (63.6%)	443 (58.4%)	549 (56.8%)	436 (83.7%)	
Turkish	622 (27.7%)	253 (33.4%)	302 (31.2%)	67 (12.9%)	
Other	196 (8.7%)	62 (8.2%)	116 (12.0%)	18 (3.5%)	
Insurance status of examined person					< 0.001†
Yes	1660 (73.7%)	467 (61.5%)	744 (76.5%)	449 (86.3%)	
No	592 (26.3%)	292 (38.5%)	229 (23.5%)	71 (13.7%)	
Household level					
Family head's sex					< 0.001†
Male	1837 (81.4%)	559 (73.3%)	809 (83.1%)	469 (89.8%)	
Female	421 (18.6%)	204 (26.7%)	164 (16.9%)	53 (10.2%)	
Family head's Job					< 0.001‡
Charity	151 (6.7%)	115 (15.1%)	32 (3.3%)	4 (0.8%)	
Temporal Worker	159 (7.0%)	118 (15.5%)	41 (4.2%)	0 (0.0%)	
Worker	340 (15.1%)	145 (19.0%)	171 (17.6%)	24 (4.6%)	
Retired	847 (37.5%)	205 (26.9%)	391 (40.1%)	251 (48.1%)	
Employee	560 (24.8%)	113 (14.8%)	256 (26.3%)	191 (36.6%)	
Employer	202 (8.9%)	67 (8.8%)	83 (8.5%)	52 (10.0%)	
Family head's education					< 0.001*
Illiterate	971 (43.0%)	500 (65.5%)	426 (43.7%)	45 (8.6%)	
1–5	773 (34.2%)	181 (23.7%)	390 (40.0%)	202 (38.7%)	
6–11	318 (14.1%)	63 (8.3%)	124 (12.7%)	131 (25.1%)	
12	152 (6.7%)	15 (2.0%)	32 (3.3%)	105 (20.1%)	
> 12	45 (2.0%)	4 (0.5%)	2 (0.2%)	39 (7.5%)	
House ownership					< 0.001*
Owner	2017 (89.3%)	633 (83.0%)	878 (90.1%)	506 (96.9%)	
Rental	242 (10.7%)	130 (17.0%)	96 (9.9%)	16 (3.1%)	
Assets %**					< 0.001*
Mean ± SD	39 ± 17	23 ± 7	39 ± 7	62 ± 11	
Median (range)	33 (0 to 100)	25 (0 to 42)	42 (17 to 67)	58 (33 to 100)	

* *P*-value based on the Spearman correlation; † Based on Mann-Whitney test; ‡ Based on Kruskal-Wallis test. ** Computed as the percentage of assets (listed in the method) available to a household.

levels. Table 1 demonstrates the number of participants, distribution of demographics and SES indicators among all participants and the three socioeconomic levels. The distribution of age, sex, education, marital status, first language, insurance status, job, home ownership and assets was significantly different among the three SES levels (all *P*-values were < 0.001). There was also a significant correlation between the sum of assets and the SES level (r = 0.880, *P* < 0.001).

Table 2 shows the association of visual problems and SES. Comparing the high and low SES groups, the prevalence of VI was approximately 2 times higher in subjects/eyes in low SES group.

Figure 2 shows the association of education and visual impairment. Obviously, people with worse visual conditions were less educated such that no one with post-secondary education was in the SVI and blind groups.

Table 3 presents the causes of any kind of VI (VA < 6/18) by SES. The proportions of avoidable causes were extremely high (more than 80%) in all SES levels. No statistically significant difference was found between type of VI in high and low SES levels (*P* = 0.59,

Table 2. Comparison of the prevalence of visual impairment and blindness by socioeconomic status based on Neumark decomposition index.

Definition	Visual Impairment	Prediction, %	Variable specific	95% CI		*P*
				Lower	Upper	
BCVA	**Prevalence in low SES group**	7.5%	- - -	5.7%	9.4%	< 0.001
	Prevalence in high SES group	3.5%	- - -	1.9%	5.1%	< 0.001
	Differences	4.1%	- - -	1.6%	6.5%	0.001
	Endowments (Explained)					
	Total	2.5%	- - -	0.9%	4.0%	0.001
	Age	- - -	2.2%	1.2%	3.2%	< 0.001
	Sex	- - -	0.0%	-0.3%	0.3%	0.991
	Education	- - -	0.2%	-1.1%	1.6%	0.728
	Marriage Status	- - -	0.3%	-0.4%	1.0%	0.363
	Ethnicity	- - -	-0.3%	-1.0%	0.4%	0.447
	Insurance	- - -	0.0%	0.0%	0.0%	0.994
	Constant	- - -	- - -	- - -	- - -	- - -
	Coefficients (Unexplained)					
	Total	1.6%	- - -	-0.3%	3.4%	0.096
	Age	- - -	6.3%	-21.1%	33.8%	0.651
	Sex	- - -	-1.7%	-10.4%	6.9%	0.694
	Education	- - -	-2.3%	-7.4%	2.7%	0.361
	Marriage Status	- - -	-2.6%	-8.8%	3.6%	0.409
	Ethnicity	- - -	-0.2%	-4.4%	3.8%	0.884
	Insurance	- - -	0.0%	-0.1%	0.2%	0.754
	Constant	- - -	2.2%	-33.4%	37.8%	0.903
PVA	**Prevalence in low SES group**	12.6%		10.2%	14.9%	< 0.001
	Prevalence in high SES group	6.0%		4.0%	8.1%	< 0.001
	Differences	6.6%		3.4%	9.7%	< 0.001
	Endowments (Explained)					
	Total	4.0%	- - -	2.1%	5.9%	< 0.001
	Age	- - -	2.9%	1.7%	4.0%	< 0.001
	Sex	- - -	0.1%	-0.3%	0.4%	0.699
	Education	- - -	0.4%	-1.3%	2.2%	0.632
	Marriage Status	- - -	0.7%	-0.1%	1.6%	0.102
	Ethnicity	- - -	-0.1%	-1.0%	0.8%	0.819
	Insurance	- - -	0.0%	0.0%	0.0%	0.994
	Constant	- - -	- - -	- - -	- - -	- - -
	Coefficients (Unexplained)					
	Total	2.6%	- - -	0.3%	4.8%	0.027
	Age	- - -	18.0%	-12.7%	48.7%	0.250
	Sex	- - -	-0.5%	-11.3%	10.4%	0.936
	Education	- - -	-4.7%	-10.9%	1.5%	0.138
	Marriage Status	- - -	-2.3%	-10.1%	5.4%	0.550
	Ethnicity	- - -	-2.4%	-7.4%	2.6%	0.351
	Insurance	- - -	0.1%	-0.2%	0.4%	0.481
	Constant	- - -	-5.6%	-46.3%	35.0%	0.785

BCVA: Best corrected visual acuity, PVA: presenting visual acuity

based on multilevel analysis) nor high and moderate SES levels (P = 0.72, based on multilevel analysis). The odds ratio of non-avoidable VI was 0.91 (95% CI: 0.30 to 2.69, P = 0.858) in high compared to low SES levels. This odds ratio was 0.77 (95% CI: 0.36 to 1.66, P = 0.510) in moderate compared to low SES levels.

Discussion

In the current study, a sample of elderly population who seemingly reached a more stable socioeconomic level was studied. According to our findings (Table 2), people with poor SES levels have an approximately two-fold higher chance of being blind or visually impaired compared to those with high SES level.

The apparent association between the prevalence of VI and SES in the current study was in line with previous studies in other countries,[16–19] and high prevalence of blindness and LV in low- and middle income communities.[20] The current results were also consistent with a previous study in this field in Iran.[12]

To obtain a more reliable estimate of economic situation and to avoid non-response bias, household asset was used as a proxy for family wealth or income which was more applicable to the study context. Tajik and Majdzadeh from Iran suggested that as

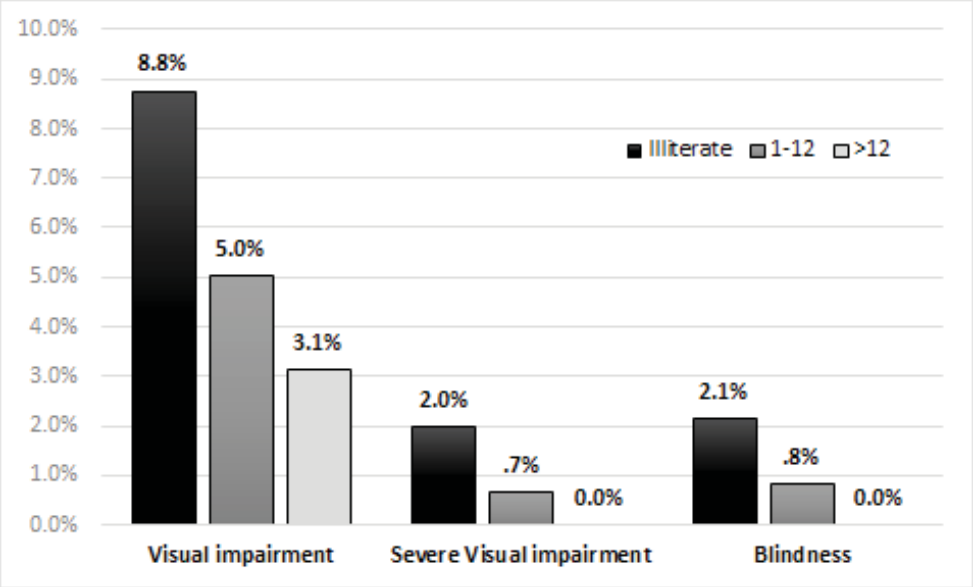

Figure 2. Association of visual impairment with education level among study participants

Table 3. Leading causes of visual impairment among study population by socioeconomic levels based on two-step cluster analysis

Parameters	Total	Socio-Economic Status		
		Low (I)	Moderate (II)	High (III)
		N = 763	N = 974	N = 522
Any visual impairment	228 (100.0%)	96 (100.0%)	101 (100.0%)	31 (100.0%)
Avoidable	192 (84.2%)	79 (82.3%)	87 (86.1%)	26 (83.9%)
Curable	155 (68.0%)	63 (65.6%)	69 (68.3%)	23 (74.2%)
Preventable	21 (9.2%)	11 (11.5%)	9 (8.9%)	1 (3.2%)
Potentially preventable	16 (7.0%)	5 (5.2%)	9 (8.9%)	2 (6.5%)
Non-avoidable	36 (15.8%)	17 (17.7%)	14 (13.9%)	5 (16.1%)

Avoidable: included all curable, preventable or potentially preventable causes. Curable: cataract, PCO; Preventable: corneal opacity, amblyopia, surgical complications, trauma; Potentially preventable: diabetic retinopathy and glaucoma; Non-avoidable: AMD, congenital dystrophies, other.

it is difficult and complicated to measure and record income in developing countries, assets can be used as a simplified alternative for income and earnings.[21] In addition, people in a household may have an unequal share of total family income but asset is usually shared by the whole family and is less prone to sudden reverse-causation problems.[13]

In this study, there was a strong and positive correlation between level of education and SES, either at individual or family head levels. In addition, the distribution of all other SES indicators was significantly and logically different among the three SES groups (Table 1). This suggests that the two-step cluster analysis method employed to differentiate the SES levels in the current study is appropriate for the selected community. Based on decomposition of influencing factors on the gap of VI between the poor and the rich (Table 2), age was the main significant factor similar to the results of Emamian, et al. in Shahroud that emphasizes the importance of paying special attention to older age groups.[12]

The coverage of health insurance was 24% less in people with low compared to high SES levels (Table 1). This could be one reason for the higher prevalence of VI in people with low SES level. In families with insufficient financial resources, health insurance coverage can provide people with more affordable health care services.

In addition, people with lower levels of education were more prone to VI (Figure 2). Some studies have emphasized the direct and linear relationship between illiteracy and blindness.[22,23] Munoz, et al. have also reported an obvious variation in terms of VI risk among people with more and less than 13 years of education.[24]

In the current study, people with lower SES tended to be more affected by preventable causes and those from higher status were more affected by curable causes; though neither of these trends were found to be statistically significant (Table 3). Nevertheless, the finding suggests that the whole survey population from all SES levels would benefit from strengthening programs for eye health system/community awareness as the considerable proportion of blinding causes were preventable or curable among all participants.

We strongly recommend that community-based modalities and preventive programs should be launched at community level in Varamin district to eliminate avoidable causes of blindness, particularly in people with lower socioeconomic statuses.

Conflicts of interest

None of the authors has any proprietary/financial interest to disclose and I have so stated on the cover page of the manuscript.

Financial support

Current budget of Shahid Beheshti University of Medical Sciences, Tehran, Iran.

References

1. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. *Br J Ophthalmol*. 2012; 96(5): 614 – 618.
2. Khanna R, Raman U, Rao GN. Blindness and poverty in India: The way forward. *Clin Exp Optom*. 2007; 90(6): 406 – 414.
3. Naidoo K. Poverty and blindness in Africa. *Clin Exp Optom*. 2007; 90(6): 415 – 421.
4. Holden BA. Blindness and poverty: A tragic combination. *Clin Exp Optom*. 2007; 90(6): 401 – 403.
5. Stevens GA, White RA, Flaxman SR, Price H, Jonas JB, Keeffe J, et al. Global prevalence of vision impairment and blindness: magnitude and temporal trends, 1990 – 2010. *Ophthalmology*. 2013; 120(12): 2377 – 2384.
6. Dandona L, Dandona R, Srinivas M, Giridhar P, Vilas K, Prasad MN, et al. Blindness in the Indian state of Andhra Pradesh. *Invest Ophthalmol Vis Sci*. 2001; 42(5): 908 – 916.
7. Kessy JP, Lewallen S. Poverty as a barrier to accessing cataract surgery: a study from Tanzania. *Br J Ophthalmol*. 2007; 91(9): 1114 – 1116.
8. Daly MC, Duncan GJ, McDonough P, Williams DR. Optimal indicators of socioeconomic status for health research. *American Journal of Public Health*. 2002; 92(7): 1151 – 1157.
9. Rajavi Z, Katibeh M, Ziaei H, Fardesmaeilpour N, Sehat M, Ahmadieh H, et al. Rapid assessment of avoidable blindness in Iran. *Ophthalmology*. 2011; 118(9): 1812 – 1818.
10. Katibeh M, Ziaei H, Rajavi Z, Hosseini S, Javadi MA. Profile of cataract surgery in Varamin Iran: a population based study. *Clinical & Experimental Ophthalmology*. 2014; 42(4): 354 – 359.
11. Katibeh M, Blanchet K, Akbarian S, Hossaini S, Ahmadieh H, Burton MJ. Planning eye health services in Varamin district, Iran: A cross–sectional study. *BMC Health Services Research*. 2015; 15(1): 140.
12. Emamian MH, Zeraati H, Majdzadeh R, Shariati M, Hashemi H, Fotouhi A. The gap of visual impairment between economic groups in Shahroud, Iran: A Blinder–Oaxaca decomposition. *Am J Epidemiol*. 2011; 173(12): 1463 – 1467.
13. Hashemi H, Rezvan F, Fotouhi A, Khabazkhoob M, Gilasi H, Etemad K, et al. Distribution of cataract surgical rate and its economic inequality in Iran. *Optometry and Vision Science: Official Publication of the American Academy of Optometry*. 2015; 92(6): 707 – 713.
14. Kuper H, Polack S, Limburg H. Rapid assessment of avoidable blindness. *Community Eye Health*. 2006; 19(60): 68 – 69.
15. Neumark D. Employers' Discriminatory Behavior and the Estimation of Wage Discrimination. *Journal of Human Resources*. 1988; 23(3): 279 – 295.
16. Tielsch JM, Sommer A, Katz J, Quigley H, Ezrine S. Socioeconomic status and visual impairment among urban Americans. Baltimore Eye Survey Research Group. *Arch Ophthalmol*. 1991; 109(5): 637 – 641.
17. Thylefors B, Negrel AD, Pararajasegaram R, Dadzie KY. Global data on blindness. *Bull World Health Organ*. 1995; 73(1): 115 – 121.
18. Salive ME, Guralnik J, Christen W, Glynn RJ, Colsher P, Ostfeld AM. Functional blindness and visual impairment in older adults from three communities. *Ophthalmology*. 1992; 99(12): 1840 – 1847.
19. Klein R, Klein BE, Jensen SC, Moss SE, Cruickshanks KJ. The relation of socioeconomic factors to age–related cataract, maculopathy, and impaired vision. The Beaver Dam Eye Study. *Ophthalmology*. 1994; 101(12): 1969 – 1979.
20. Dandona R, Dandona L. Review of findings of the Andhra Pradesh Eye Disease Study: Policy implications for eye–care services. *Indian J Ophthalmol*. 2001; 49(4): 215 – 234.
21. Tajik P, Majdzadeh R. Constructing pragmatic socioeconomic status assessment tools to address health equality challenges. *International Journal of Preventive Medicine*. 2014; 5(1): 46 – 51.
22. Li L, Guan H, Xun P, Zhou J, Gu H. Prevalence and causes of visual impairment among the elderly in Nantong, China. *Eye (Lond)*. 2008; 22(8): 1069 – 1075.
23. Xu L, Wang YX, Jonas JB. Level of education associated with ophthalmic diseases. The Beijing Eye Study. *Graefes Arch Clin Exp Ophthalmol*. 2010; 248(1): 49 – 57.
24. Munoz B, West SK, Rodriguez J, Sanchez R, Broman AT, Snyder R, et al. Blindness, visual impairment and the problem of uncorrected refractive error in a Mexican–American population: Proyecto VER. *Invest Ophthalmol Vis Sci*. 2002; 43(3): 608 – 614.