Prevalence of cataract and its associated factors among adults aged 40 years and above in Waghimra zone, Amhara, Northeast Ethiopia: A Community based cross-sectional study

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Abstract

Background Cataract is a major cause of avoidable blindness worldwide. Its greatest burden found in low-income countries. Therefore, knowing the prevalence and identification of risk-factors would be crucial in planning strategies to delay its development. Objective To assess prevalence and associated factors of cataract among adults aged 40 years and above in Waghimra Zone, Amhara, Ethiopia, 2019. Methods A cross-sectional study was undertaken among 528 adults in Waghimra Zone. Multi stage sampling technique was employed. Questionnaire, Snellen’s chart and slit lamp was used to collect the data. Data were entered into Epi Data version 3.1, cleaned and analyzed by using SPSS version 21.

Result Within the sample, the prevalence of cataract was 20.1% (95% CI: 16.87, 23.32). being older age (AOR=1.05, 95% CI: 1.01-1.08), single (AOR = 6.2, 95% CI: 1.60, 23.9), divorced (AOR = 2.46, 95% CI: 1.10, 5.48), widowed (AOR=2.38, 95% CI: 1.07- 5.29) were associated with cataract.

Conclusion Cataract is a major health problem in the study area that would increase with ageing. Hence, concerned body should strengthen further screening and treating of patients who are targeted groups such as aged, single, widowed, divorced population.

Introduction

Cataract is defined as partial or complete opacification of the crystalline lens and is considered the primary cause of vision loss worldwide (1). It is the leading cause of blindness accounting for nearly 48% of blindness globally (2). Although the actual mechanism of cataract development remains unclear, several risk factors have been established, including age, sunlight (UV) exposure, corticosteroid use, trauma, hypertension, Diabetic Mellitus, and smoking, have resulted in a large public health
The studies also found higher prevalence of self-reported cataract among individuals with lower income, lower education, urban residency, female sex, and intake of antidepressants (4, 5).

Along with the aging population and extended life expectancy, the number of people with cataract is expected to increase continuously. Cataract can be cured by surgery, which ranks as the most cost-effective intervention with financial return on investment (6).

Currently, the standard treatment for cataract is surgical extraction of the opaque lens with an implantation of an artificial lens (7).

A study reported that lack of awareness of cataract and its treatment option and the cost of surgery to be the two main barriers to the uptake of cataract surgical services in Latin America (8). Cataract remains a concern for public health, especially in low- and middle-income countries. A total of $5733 million investment was estimated to be required for eliminating blindness due to cataract between 2010 and 2020 (9).

According to a World Health Organization (WHO) report, un-operated cataract accounts for 25% of the global visual impairment burden, second only to refractive errors which accounts for 53% of visual impairments. Cataract has caused worldwide > 50% vision loss, including 33.4% blind people and 18.4% people with moderate-to-severe visual impairment (10). Globally, 10.8 million were blind and 35.1 million people were visually impaired from cataract in 2010 (1, 10). Cataract causes vision loss in over 80 million people and blinds 18 million worldwide (11). Age-related cataracts constitute approximately 50% of the 285 million visually-impaired people globally; 39 million (13.7%) of whom are blind (12).

Over 90% of cataract cases are concentrated in individuals aged ≥ 50 years in lower middle income countries (LMICs) where health care access is limited. Similarly, approximately 80% and 90% of cataract related blindness, and visually impairment are
concentrated LMICs respectively (11, 13, 14). In Sub-Saharan Africa, they account for 50% of the 26 million visually-impaired people, 5.9 million (22.7%) of whom are blind (15, 16). Despite Sub-Saharan Africa (SSA) having one of the highest prevalence of cataracts and cataract related blindness, it remains a grossly underserved region (17).

Visual impairment can cause disabilities by significantly interfering with one’s ability to function independently. These disabilities limit personal or socioeconomic independence and a visual handicap exists. The good news is that more than two third of this visual impairment and blindness can be avoidable either by prevention and treatment. According to ‘vision 2020 the right to sight’ plan, in 2020 preventable and avoidable causes of visual impairment and blindness will be reduced significantly to less than 0.5% in all countries or less than 1% in any community worldwide (18, 19).

Ethiopia is believed to have one of the world’s highest rates of blindness (1.6%) and low vision (3.7%), of which more than 80% is either treatable or preventable. Cataract is the first leading cause of low vision in Ethiopia accounting for 42.3% and the leading cause of blindness accounting for 49.9%(20). Different studies showed that cataract is a problem that apparent in different countries with different magnitude For instance is: 47.5% in southern India(21), 11.6% in puducherry, India (22), 19.8% in Nigeria (23), 20% in Nigerian tertiary hospital(24), 14.2% in korea (25), 39.05% in Gahna (26). Several studies showed that various factors were positively associated with cataract such as ageing, sex, educational level, occupation residence, occupation, family size, household wealth status and educational level (3, 27). And also, smoking ,alcohol consumption ,diabetes, hypertension and obesity and Environmental factors such as trauma (eye injury) and UV/sunlight exposure have been associated with cataract (1, 2).

Therefore, knowing the prevalence of cataract and its associated factors in the community early helps to avoid blindness and gives as an input for successful implementation of
VISION 2020 programmers in Ethiopia. However, there were few studies done on the prevalence of cataract and associated factors among adult patients aged 40 and above by community based study in Ethiopia in general, and no study was done in the study area in particular. Therefore, the aim of this study was to assess the prevalence of cataract and associated factors among adult patients aged 40 and above in the study area.

Methods

A Community based cross-sectional study was conducted from May 1- June 30, 2019 in Waghimra zone. This zone is one of the 11 administrative zones in Amhara National Regional State (ANRS) and located in Northeast Ethiopia under Amhara regional state and its capital city is Sekota. There are 6 districts under the wings of Waghimra zone. Those districts are; Sekota, Dehana, Ziquala, Abergelle, Sehila, and Gazgibla. The altitude of Waghimra zone varies from 900 – 2200 meters above sea level while the average temperature ranges from 16 – 27°C. This study was focused on Sekota zurea, Dehana, Ziquala Woredas which was selected randomly.

All adults age 40 years old and above in Waghimra Zone was the source population where as Selected adults age 40 years old and above in Waghimra Zone were the study population. Adults age 40 years old and above who live in Waghimra Zone for more than six months were included in the study. Respondents who are not able to speak or who are severely ill were excluded.

The sample size was determined using single population proportion formula by using the following assumptions, 95% confidence level, 5% margin of error. and 181(20.5%) proportion from a previous study(28).

[Due to technical limitations, the formulas could not be displayed here. Please see the supplementary files section to access the formulas.]
The final sample size become **528** by adding non response rate 5% and design effect of 2.

Multi-stage random sampling was used to identify a representative sample of people aged 40 years and above. First 3 districts (Sekota zurea, Dehana and Ziquala) were selected using simple random sampling technique. Then kebeles in the selected districts were stratified into Urban and Rural kebeles. Kebeles in the selected districts were selected using simple random sampling technique. Adults with age 40 and above in the selected kebeles were identified and sampling frame was prepared. The samples were allocated proportionally based on number of study participants. Finally, Participants in each selected kebeles were selected by using simple random sampling. The sample frame was the list of households that have adults age more than 40 years old and it was constructed after checking all selected kebeles. In households with two or more individuals more than 40 years of age, one was selected randomly by lottery method.

[Figure 1]

The main outcome of interest was presence or absence of cataract. Independent variables were selected based on literature review on factors associated with outcome of interest and include age, sex, marital status, residence, educational level, occupation, income, family size, history of hypertension, Trauma (eye injury), UV/sunlight exposure, smoking and alcohol.

After taking informed verbal consent, the eligible persons was interviewed through interviewer administered questionnaire regarding aforementioned variables. Questionnaire was administered by trained ophthalmic nurse practitioners and followed by clinical examination using Snellen’s visual acuity chart, and slit lamp in order to assess visual acuity and any opacity (cloudiness) of crystalline lens (cataract). Data collector and the supervisors were delivered two days training on techniques of data collection, instruments and how to maintain ethical issue. To assure the quality of the data, supervisors was
closely supervise the data collection procedure on daily basis. Review was made in the field for checking the completeness of questionnaire and correction was made in the field. Each questionnaire and data sheet was checked prior to the data entry.

Data entry were carried out using Epidata version 3.1, cleaned and analyzed by using SPSS version 21. Descriptive statistics, including frequencies, median and percentages were used to describe characteristics of participants. Bivariate analysis was carried out using logistic regression for independent variables with an outcome variable to select candidate variables for multivariate analysis. Finally, variables that had significant associations with cataract on multivariate analysis were identified based on the adjusted odd ratio (AOR) with a 95% CI and p-value < 0.05.

Result

Socio-demographic characteristics of the respondents
A total number of participants included in the study were 528. Within the sample, 59.7% of Participants were male, 52.5% lived in urban area, 79.9% were farmer, and the median age of the participants were 59.0 years. Table 1 below lists detailed characteristics of the study population.

Table 1: Socio-demographic characteristics of the respondents in Waghimra zone, 2019 (n=528)
| Variable         | Category                    | Frequency |
|------------------|-----------------------------|-----------|
| Sex              | Male                        | 213       |
|                  | Female                      | 315       |
| Age (years)      | Median = 59                 |           |
| Marital status   | Single                      | 22        |
|                  | Married                     | 229       |
|                  | Divorced                    | 165       |
|                  | Widowed                     | 112       |
| Residence        | Urban                       | 277       |
|                  | Rural                       | 251       |
| Educational status | can't read and write       | 100       |
|                  | able to read and write      | 4         |
|                  | Primary /secondary education | 2         |
| Occupation       | Farmer                      | 422       |
|                  | Employed/daily laborer      | 26        |
|                  | Merchant/house wife         | 44        |
|                  | Others*                     | 36        |
| Family size      | Median= 4                   |           |
| Monthly income   | Median = 700                |           |
| Total            |                             | 106       |

*shows retirement , commercial sex worker

Health related factors

Within the sample (528), 88.8 % of the participants were drunk alcohol, 98.9 % didn’t smoke cigarettes, 96.2% didn’t have hypertension, and 14.4% of them experienced eye trauma.

In addition, 20.1% of the participants had normal vision of visual acuity, 22.3% had mild visual impairment, and 3% of them didn’t have light perception. **Table 2 below** lists detailed characteristics of the study population.

Table 2: Health related profile of the participants in Waghimra Zone, 2019 (n=528)
**Prevalence of cataract**

In this study, the prevalence of cataract was 20.1% (95% CI: 16.87, 23.32).

**Factors associated with cataract among adults aged 40 years and above in Waghimra zone, Ethiopia.**

In Bivariate logistic regression analysis, factors such as sex of the respondents, age, marital status, residence, educational status, occupation, family size, monthly income, smoking, eye trauma, sunlight exposure, and visual acuity status were associated with cataract at P-value of< 0.25. *(See detailed in table 3)*

Table 3: Bivariate analysis of factors associated with cataract among adults aged 40 years and above in Waghimra zone, Ethiopia, 2019 (n=528)
| Variables                          | Category          | Cataract |
|-----------------------------------|-------------------|----------|
| Sex of the respondents            |                   |          |
| Male                              | 53                | 1        |
| Female                            | 53                | 2        |
| Age (years)                       |                   |          |
| Median = 59.0                     |                   |          |
| Marital status                    |                   |          |
| Single                            | 6                 |          |
| Married                           | 27                | 2        |
| Divorced                          | 31                | 1        |
| Widowed                           | 42                |          |
| Residence                         |                   |          |
| Urban                             | 40                | 2        |
| Rural                             | 66                | 1        |
| Educational status                | can't read and write | 100 | 3 |
| able to read and write            | 4                 |          |
| Primary or secondary education    | 2                 |          |
| Occupation                        |                   |          |
| Farmer                            | 94                | 3        |
| Employed / daily labourer         | 2                 |          |
| Merchant / House wife             | 4                 |          |
| Others*                           | 6                 |          |
| Family size                       | Median = 4        |          |
| Monthly income                    | Median = 700      |          |
| Alcohol                           | Yes               | 92       | 377 |
|                                   | No                | 14       | 45  |
| Smoking                           | Yes               | 4        | 2    |
|                                   | No                | 106      | 420 |
| Hypertension                      | Yes               | 2        | 18   |
|                                   | No                | 104      | 404 |
| Eye trauma                        | Yes               | 8        | 68   |
|                                   | No                | 98       | 354 |
| Sunlight exposure                 | Yes               | 8        | 11   |
|                                   | No                | 98       | 411 |
| Right or left eye visual acuity   | No light Perception | 10    | 6   |
|                                   | Light perception  | 32       | 32   |
|                                   | Hand movement     | 12       | 24   |
|                                   | Normal vision     | 6        | 100  |
|                                   | Mild visual impairment | 6   | 112  |
|                                   | Moderate visual impairment | 14 | 111  |
|                                   | Sever visual impairment | 26  | 37   |
| Total                             |                   | 106      | 422  |
When variables that had association with cataract in the bivariate analysis (P-value < 0.25) were all included in multivariable logistic regression model using enter method it was found that age of the respondents, marital status, eye trauma, and visual acuity had statistically significant association with cataract (p-value < 0.05).

In this study, as age increases by one year, the odds of cataract increased by 1.05 (95% CI: 1.01-1.08). The odds of cataract was 6.2 times more (AOR = 6.2, 95% CI: 1.60, 23.9) among those who were single compared with those who had married. Likewise, 2.46 times more (AOR = 2.46, 95% CI: 1.10, 5.48) among those who were divorced compared with those who had married. The odds of cataract was 0.29 times less (AOR = 0.29, 95% CI: 0.12-0.70) among those who had eye trauma compared with those who had not have trauma. (see detailed in table 4)

Table 4: Multivariate analysis of factors associated with cataract among adults aged 40 years and above in Waghimra zone, Ethiopia, 2019 (n=528)

| Variables          | Category   | Cataract | COR (95 % CI) | AOR (95 % CI) | p-value |
|--------------------|------------|----------|---------------|---------------|---------|
| Sex of the        | Male       | Yes 53  | 1.64(1.06-2.51) | 1.16(0.60-2.22) | 0.66    |
| respondents        |            | No 160 |               |               |         |
|                    | Female     | Yes 53  | 1             | 1             |         |
|                    |            | No 262 |               |               |         |
| Age (years)        | Median =59.0 |        | 1.07(1.05-1.09) | 1.05(1.01-1.08) | 0.007   |
| Marital status     | Single     | Yes 6   | 2.8(1.01-7.78) | 6.20(1.60-23.9) | 0.00    |
|                    |            | No 16 |               |               |         |
|                    | Married    | Yes 27  | 1             | 1             |         |
|                    |            | No 202 |               |               |         |
|                    | Divorced   | Yes 31  | 1.73(0.98-3.03) | 2.46(1.10-5.48) | 0.02    |
|                    |            | No 134 |               |               |         |
|                    | Widowed    | Yes 42  | 4.49(2.58-7.82) | 2.38(1.07-5.29) | 0.03    |
|                    |            | No 70  |               |               |         |
| Residence          | Urban      | Yes 40  | 1             |               |         |
|                    |            | No 237 |               |               |         |
|                    | Rural      | Yes 66  | 2.11(1.365-3.27) | 0.77(0.42-1.43) | 0.414   |
|                    |            | No 185 |               |               |         |
| Educational status | can't read | Yes 100 | 1             |               |         |
|                    | and write  | No 375 |               |               |         |
|                    | able to    | Yes 4   | 0.56(0.19-1.62) | 1.06(0.27-4.06) | 0.93    |
|                    | read and   | No 27  |               |               |         |
|                    | write      |         |               |               |         |
## Discussion

In the present study the prevalence of cataract was 20.1 % (95% CI: 16.87, 23.32). This

| Occupation           | Farmer | Employed / daily labourer | Merch ant / House wife | Other s* |
|----------------------|--------|---------------------------|------------------------|----------|
|                      | 94     | 2                         | 4                      | 6        |
| Occupation           |        |                           |                        |          |
| Smoking              | 4      | 2                         | 8                      | 6        |
| Sunlight exposure    | 8      | 11                        | 3.05 (1.19-7.78)       | 0.06     |
| Total                | 106    | 422                       |                        |          |
finding is higher than other studies conducted within the communities in Korea (4), Ghana (5), Nigeria (23), India (22), but lower than studies conducted in China (29), Ghana (26), India (30,31), Sri Lanka (6), Singapore (32). The variation is largely due to the different methodological approaches adopted by authors from time to time, racial, residence (urban verses rural participants), and sample size differences in the populations studied. In the present study as age increases, the cataract also increased. The close association of cataract with increasing age has been well documented by studies in India (30,33,34), China (35), Taiwan (36), Korea (37). This is due to with increasing age, the amount of proteolytic enzymes are reduced, thus promoting the formation of protein aggregates in the, which leads to cataract and loss of visual acuity (38).

Being single, widowed or divorced were statistically associated with increasing the odds of cataract when compared with being married in this study. Similarly, a multicentre population-based study in Kenya, Philippines and Bangladesh showed that being married was a protective factor for cataract (39). This is due to ‘marital effect’ has important public health implications because widowed, divorced or single status may exacerbate vision impairment due to the lack of material resources, emotional support, self-fulfillment and information with respect to eye care, vision rehabilitation and healthy lifestyle (40).

In this study participants who had eye trauma were decreasing the odds of cataract. This may be due to age related type of cataract in this study and the trauma faced by the respondent may be superficial. Moreover, participants who had severe visual impairment and didn’t perceive light were associated with increased the odds of cataract in this study. This is explained by the effect of aging in relation to decreasing visual acuity, as a result, cataract become evident.

Conclusion

The present study concluded with the findings highlighting the huge burden of cataract in
the study area and the role of increasing age, being single, divorced, Widowed, and severe visual impairment pointing towards a multi-factorial association. Hence, the concerned bodies should strengthen further screening and treating of cataract patients who are targeted groups such as aged population as early as possible.

Abbreviation

**SPSS**: Statistical Package for Social Science ; **WHO**: World Health Organization ; **VA**: Visual Acuity

Declarations

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**Availability of data and materials**

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request.

**Author’s contributions**

MA: conceived the research idea, conducted the data collection, data analysis and data interpretation, wrote and reviewed the paper. BB, AM and MM supervises the data collection and analysis, reviewed and approved the final manuscript. All authors’ read and approved the final manuscript.

**Ethics approval and consent to participate**

Ethical clearance for the study was obtained from the ethical review committee of Woldia
University, Faculty of Health Sciences. Permission to conduct the study was also be obtained from the Waghimra Zone and Woreda health office. Individual verbal and written informed consent was obtained from every study participant and those who agree was participated in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests

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Figures
Figure 1

Schematic presentation of sampling Technique for studying prevalence of cataract and associated factors in Waghimra zone, 2019