



Relationship Between The Public's Level of Knowledge About Eye Health, Age, Gender, and Education and The Incidence of Eye Diseases In The Batang Iii Community Health Center District

Olivia Puji Lestari^{1*}, Swasty², Afiana Rohmani³,

¹⁻³ Universitas Muhammadiyah Semarang, Indonesia

email: oliviapujilestari@gmail.com¹

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Abstract

Eye diseases remain an important community health problem because their occurrence may be influenced by demographic characteristics and public knowledge of eye health. This study examined the relationships between eye health knowledge, age, gender, educational level, and eye disease occurrence in the Batang III Community Health Center area. A case-control design was used with 76 respondents, comprising 38 cases with eye disease and 38 controls without eye disease. Data were collected through questionnaires and medical records and analyzed using the Chi-square test. Age was significantly associated with eye disease occurrence ($p=0.026$), as were gender ($p=0.044$), educational level ($p=0.006$), and eye health knowledge ($p=0.009$). Conjunctivitis was the most frequently identified eye disease, while respondents with good knowledge were more commonly found in the control group. Eye disease occurrence in this community was significantly associated with demographic and knowledge-related factors. Strengthening eye health education, early detection, and preventive services through primary healthcare may help improve community awareness and support timely use of eye care services, especially among locally identified groups with moderate knowledge and differing educational backgrounds.

Keywords: community knowledge, education, eye disease, eye health, primary healthcare.



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INTRODUCTION

Eye health disorders constitute an important public health concern because they may affect visual function, productivity, mobility, and quality of life when they are not identified and managed appropriately (Ilyas & Yulianti, 2015). Ocular disorders can occur in various forms, including refractive errors, conjunctivitis, cataract, glaucoma, and age-related macular degeneration, each of which has different clinical characteristics and consequences for visual function (Hartono et al., 2013). Some eye disorders may present with redness, pain, or decreased visual acuity, whereas others can progress without symptoms that are immediately recognized by patients (Sitorus et al., 2017). Therefore, public understanding of early symptoms, risk factors, preventive measures, and appropriate timing for seeking medical care is essential for maintaining eye health and preventing avoidable complications (Xulu-Kasaba et al., 2021).

Visual impairment remains a significant health problem because its occurrence is influenced by uncorrected refractive errors, cataract, glaucoma, and other ocular diseases (Kementerian Kesehatan Republik Indonesia, 2018). Cataract is one of the major causes of visual impairment and develops through progressive changes in lens transparency that may result in worsening visual function when appropriate treatment is not provided (Astari, 2018). Glaucoma also has serious implications because progressive optic nerve damage can result in irreversible visual loss once structural damage has occurred (Schuster et al., 2020). Age-related macular degeneration further demonstrates that degenerative changes in ocular structures can substantially affect visual ability, particularly among older populations (Stahl, 2020).

Health knowledge is an important component that influences an individual's ability to recognize problems, understand health information, and determine appropriate actions in response to

health conditions (Masykur, 2019). In the context of eye health, adequate knowledge can help individuals recognize signs and symptoms of ocular disorders, understand preventive behaviors, and seek health services before complications develop (Xulu-Kasaba et al., 2021). Health education has been shown to improve knowledge of ocular disorders, as demonstrated by educational interventions concerning refractive errors among elementary school students and eye health education among adolescents (Hajar et al., 2019). The relationship between knowledge and preventive behavior has also been reported among individuals at risk of glaucoma, where higher knowledge was associated with better preventive efforts (Siswoyo et al., 2018).

Limited knowledge of eye health is not only found among the general population but may also occur among students and university populations who are expected to have relatively broader access to health information (Risma et al., 2022). Studies on conjunctivitis indicate that understanding of causes, symptoms, transmission, and prevention of eye disease still needs to be strengthened among school and university populations (Khan et al., 2017). Knowledge about conjunctivitis is particularly relevant because this condition is commonly encountered in outpatient eye care and may be associated with infectious agents, irritants, and environmental exposure (Insani et al., 2017). These findings indicate that access to information does not automatically ensure adequate eye health knowledge, highlighting the need for empirical assessment of community knowledge levels (Putra et al., 2019).

Age is another demographic factor that should be considered in the epidemiology of eye diseases because anatomical, physiological, behavioral, and environmental exposures change throughout the life course (Sherwood, 2020). Several ocular disorders tend to become more common within particular age groups, including cataract, which is closely related to degenerative changes in the lens and generally increases with advancing age (Astari, 2018). Clinical studies in Indonesia have also demonstrated an association between age characteristics and cataract occurrence among patients receiving eye care services (Fernanda et al., 2020). These variations suggest that age should be assessed together with other factors because the occurrence of eye diseases in a community is not determined solely by biological changes but also by behavioral, environmental, and healthcare-related factors (Tamansa et al., 2016).

Gender is another demographic characteristic that may be associated with variations in the occurrence of eye disorders through differences in daily activities, environmental exposure, protective behavior, and utilization of healthcare services (Fernanda et al., 2020). Exposure to dust, ultraviolet radiation, irritants, and certain occupational environments may increase the risk of ocular problems among individuals who engage more frequently in outdoor activities (Ilyas & Yulianti, 2015). The distribution of eye diseases by gender is not necessarily consistent across all types of ocular disorders, meaning that such relationships need to be examined according to the characteristics of the population and disease under investigation (Tamansa et al., 2016). Accordingly, gender should be analyzed together with knowledge, age, and education to provide a more comprehensive understanding of demographic factors associated with eye disease occurrence in the community.

Education is closely related to an individual's ability to access, understand, evaluate, and apply health information in everyday decision-making (Masturoh & Anggita, 2018). A higher level of education generally provides greater opportunities to obtain and interpret health information, although formal education is not the only pathway through which health knowledge is acquired (Masykur, 2019). Previous research on ocular diseases has shown that education may be associated with the risk of eye disorders, including studies identifying differences in cataract risk according to respondents' educational attainment (Ulandari et al., 2014). This relationship supports the need to examine education simultaneously with eye health knowledge because both variables may contribute to preventive behavior, early detection, and appropriate utilization of eye care services.

Community health centers have a strategic role as primary healthcare facilities emphasizing promotive and preventive services in addition to curative care for populations within their working areas (Putri et al., 2017). The original study indicates that a number of eye disease cases had been recorded in the Batang III Community Health Center area, while no previous study had specifically evaluated the relationship between eye health knowledge, demographic characteristics, and eye disease occurrence in this setting. This situation highlights the need for local evidence to clarify the relationships between knowledge, age, gender, education, and eye disease incidence so that health education and preventive interventions can be adjusted to community characteristics (Djajanti et al., 2020). Therefore, this study aims to analyze the relationship between the level of public knowledge

regarding eye health, age, gender, educational level, and the occurrence of eye diseases in the Batang III Community Health Center area.

RESEARCH METHODS

This study employed a case-control design to examine the relationship between public knowledge of eye health, age, gender, educational level, and the occurrence of eye diseases in the working area of the Batang III Community Health Center. The study population consisted of community members residing within the Batang III Community Health Center area who met the predetermined inclusion and exclusion criteria. The inclusion criteria were willingness to participate by providing informed consent, ability to communicate effectively, residence within the Batang III Community Health Center area, and an age range of 17–55 years. Respondents who refused to participate or did not complete the questionnaire were excluded from the study. A total of 76 respondents were included, consisting of 38 participants in the case group who had eye diseases and 38 participants in the control group who had no diagnosed eye disease. Sampling was conducted using a probability sampling approach with simple random sampling.

The independent variables in this study were the level of knowledge regarding eye health, age, gender, and educational level, while the dependent variable was the occurrence of eye disease in the community. Data on respondent characteristics and eye health knowledge were collected using a structured questionnaire, whereas information regarding eye disease status was obtained from medical records. The questionnaire was used to identify demographic characteristics and assess respondents' level of knowledge related to eye health. The collected data were categorized according to the predefined variables and subsequently analyzed to determine the relationship between each independent variable and the occurrence of eye disease. Bivariate analysis was performed using the Chi-square test because the variables were categorical. A p-value of less than 0.05 was considered statistically significant in determining the presence of an association between the investigated variables and eye disease occurrence.

RESULTS AND DISCUSSION

Age and Gender in Relation to Eye Disease Occurrence

The findings demonstrate that age was significantly associated with the occurrence of eye diseases among respondents in the Batang III Community Health Center area, with a p-value of 0.026. This result indicates that the distribution of eye disease cases differed across age groups within the study population. The highest proportion of respondents with eye disease was found in the early-adulthood group, whereas respondents without eye disease were more frequently represented in the early-elderly group. Age therefore appears to be an important demographic characteristic that should be considered when examining the occurrence of ocular disorders in the community (Fernanda et al., 2020).

Biological changes associated with aging may influence susceptibility to different types of ocular disorders because ocular tissues undergo gradual structural and functional changes across the life course. Degenerative alterations of the lens, retina, optic nerve, and other ocular structures become increasingly relevant with advancing age and may contribute to the development of cataract, glaucoma, and age-related macular degeneration (Schuster et al., 2020; Stahl, 2020). Cataract, in particular, is strongly associated with progressive lens opacity and age-related changes that can reduce visual function when left untreated (Astari, 2018). Nevertheless, the present findings suggest that eye disease occurrence in the study population was not concentrated solely among older respondents, indicating that behavioral and environmental exposure may also play an important role.

The relatively high number of eye disease cases among respondents in early adulthood may be related to greater mobility, occupational activity, outdoor exposure, and prolonged use of digital devices. Adults in this age group may experience frequent exposure to dust, sunlight, irritants, and infectious agents, all of which can affect ocular health depending on the specific condition involved (Ilyas & Yulianti, 2015). In the original dataset, conjunctivitis constituted the largest proportion of identified eye diseases, suggesting that infectious or inflammatory eye conditions contributed substantially to the observed age pattern. Previous outpatient-based research has similarly reported that conjunctivitis can affect a broad range of age groups rather than being restricted to children or older adults (Insani et al., 2017).

The occurrence of conjunctivitis among active adults is epidemiologically plausible because frequent interpersonal contact, inadequate hand hygiene, environmental exposure, and touching or rubbing the eyes may facilitate irritation or transmission of infectious agents. Conjunctivitis is characterized by inflammation of the conjunctiva and commonly presents with eye redness, discomfort, discharge, itching, or tearing depending on its cause (Kanski & Bowling, 2011). Public awareness of these signs is important because poor understanding may delay appropriate management or increase the possibility of transmission in infectious cases (Khan et al., 2017). Knowledge concerning common eye diseases therefore remains relevant even when demographic factors such as age are statistically associated with disease occurrence.

Table 1. Distribution of Eye Disease Occurrence According to Age and Gender

Variable	Category	Eye disease, n (%)	No eye disease, n (%)	Total	p-value
Age	Late adolescence	5 (13.2)	5 (13.2)	10	0.026
	Early adulthood	13 (34.2)	9 (23.7)	22	
	Late adulthood	10 (26.3)	6 (15.8)	16	
	Early elderly	10 (26.3)	18 (47.4)	28	
Gender	Male	21 (55.3)	24 (63.2)	45	0.044
	Female	17 (44.7)	14 (36.8)	31	

Source: Primary research data processed from the Batang III Community Health Center study

Gender was also significantly associated with eye disease occurrence, with a p-value of 0.044. Among respondents with eye disease, 21 participants were male and 17 were female, whereas the control group consisted of 24 males and 14 females. The numerical distribution therefore indicates a greater representation of men in both groups, although the proportions differed sufficiently to produce a statistically significant association in the bivariate analysis. Similar investigations have reported that gender may be associated with selected ocular diseases, although the direction and magnitude of this relationship can vary according to disease type and population characteristics (Tamansa et al., 2016).

Differences in daily activities may partially explain the observed association between gender and eye disease occurrence. Men in some communities may be more frequently involved in outdoor occupations or activities that increase exposure to ultraviolet radiation, dust, wind, chemicals, or other ocular irritants. Repeated environmental exposure without appropriate eye protection can contribute to irritation and may increase vulnerability to certain ocular conditions (Ilyas & Yulianti, 2015). However, gender should not be interpreted as an isolated biological determinant because occupational roles, lifestyle, protective practices, healthcare-seeking behavior, and environmental exposure can influence the observed distribution.

Previous studies have also demonstrated that age and gender can show different patterns depending on the specific eye disease being investigated. Fernanda et al. (2020) reported an association between age, gender, and cataract occurrence among patients attending an ophthalmology clinic, while Tamansa et al. (2016) similarly examined these demographic characteristics in relation to cataract cases. Such findings support the broader view that demographic characteristics may contribute to variations in eye disease profiles across patient populations. Nevertheless, direct comparison should be made cautiously because the present study included several types of eye disease rather than focusing exclusively on one diagnosis.

The clinical heterogeneity of eye diseases identified in this study is important when interpreting the associations with age and gender. Conjunctivitis represented the largest disease category, while cataract, hypermetropia, and glaucoma were also recorded among respondents with eye disease. These conditions differ substantially in pathophysiology, risk factors, disease progression, and age distribution, meaning that a single demographic characteristic cannot explain their occurrence uniformly (Corwin, 2009; Sitorus et al., 2017). Glaucoma involves progressive optic nerve damage, cataract involves lens opacity, and conjunctivitis primarily reflects inflammation of the conjunctiva, demonstrating that the study outcome encompasses clinically diverse disorders (Dietze et al., 2021).

The findings therefore suggest that age and gender should be interpreted as population-level characteristics associated with eye disease occurrence rather than as direct causal determinants. Because the study employed a case-control design and bivariate Chi-square analysis, the observed

relationships indicate statistical associations but do not establish causal pathways. Factors such as occupation, eye-protection practices, access to healthcare, comorbid conditions, hygiene behavior, and exposure to digital screens or environmental irritants were not simultaneously controlled in the reported analysis. Further studies using multivariable models would be valuable for estimating the independent contribution of demographic factors while controlling for potential confounding variables (Masturoh & Anggita, 2018).

From a public health perspective, the significant associations of age and gender with eye disease occurrence highlight the importance of adapting eye health promotion to demographic characteristics within the community. Health education delivered through primary healthcare services can emphasize early recognition of visual problems, proper eye hygiene, use of protective eyewear when appropriate, and timely examination for persistent ocular symptoms. Community health centers are strategically positioned to deliver preventive and promotive interventions because they serve populations directly and can integrate education with routine primary care activities (Putri et al., 2017). Age- and gender-sensitive approaches may therefore strengthen local prevention strategies while ensuring that interventions remain focused on modifiable behaviors rather than demographic characteristics alone.

Educational Level and Eye Health Knowledge in Relation to Eye Disease Occurrence

The present study found a statistically significant relationship between educational level and the occurrence of eye disease in the Batang III Community Health Center area, with a p-value of 0.006. Among respondents with eye disease, the largest proportion was found among those who had completed senior high school, accounting for 17 respondents or 44.7% of the case group. In contrast, respondents without eye disease were most frequently represented by those with higher education, with 18 respondents or 47.4% of the control group. These findings suggest that educational attainment may be associated with differences in health information access, understanding of preventive behavior, and utilization of appropriate eye care services (Ulandari et al., 2014).

Education is generally associated with an individual's capacity to obtain, process, and interpret information relevant to health-related decision-making. Individuals with greater educational exposure may have more opportunities to recognize risk factors, understand disease symptoms, and respond appropriately when health problems arise, although educational level alone does not automatically determine health behavior (Masturoh & Anggita, 2018). Knowledge can also be acquired through personal experience, family interaction, community education, mass media, and healthcare services outside formal educational institutions (Masykur, 2019). Accordingly, the significant relationship observed in this study should be understood as an association between education and disease occurrence rather than evidence that formal education directly prevents eye disease.

The pattern identified in the present study is consistent with previous evidence showing that educational attainment may be related to ocular health outcomes. Ulandari et al. (2014) reported that education was associated with cataract occurrence and that respondents with lower levels of education had a higher risk of developing cataract compared with those with higher educational attainment. Educational differences may influence the ability to understand early symptoms, comply with preventive advice, and seek professional eye examinations before a condition becomes more severe. Nevertheless, such associations may also reflect broader socioeconomic, occupational, environmental, and healthcare access differences that were not independently evaluated in the current study.

Educational level may also affect the way individuals understand common ocular conditions such as conjunctivitis, refractive errors, cataract, and glaucoma. Insufficient understanding of disease transmission, ocular hygiene, or warning symptoms may result in delayed health-seeking behavior or inappropriate self-management. Studies among students have demonstrated that knowledge of eye disorders can remain suboptimal even in populations with access to formal education, indicating that educational attainment and disease-specific knowledge are not interchangeable concepts (Risma et al., 2022). Similar observations have been made in research assessing university students' awareness of conjunctivitis, where specific gaps in understanding of prevention and management were still identified (Khan et al., 2017).

Table 2. Distribution of Eye Disease Occurrence According to Educational Level and Eye Health Knowledge

Variable	Category	Eye disease, n (%)	No eye disease, n (%)	Total	p-value
Educational level	Elementary school	2 (5.3)	3 (7.9)	5	0.006
	Junior school	8 (21.1)	6 (15.8)	14	
	Senior school	17 (44.7)	11 (28.9)	28	
	Higher education	11 (28.9)	18 (47.4)	29	0.009
	Good	9 (23.7)	22 (57.9)	31	
	Moderate	25 (65.8)	13 (34.2)	38	
Eye health knowledge	Poor	4 (10.5)	3 (7.9)	7	

Source: Primary research data from respondents in the Batang III Community Health Center area

The level of eye health knowledge was also significantly associated with eye disease occurrence, as indicated by a p-value of 0.009. Respondents with good knowledge were predominantly found in the group without eye disease, where 22 respondents or 57.9% demonstrated good knowledge, compared with only 9 respondents or 23.7% in the disease group. Conversely, moderate knowledge was most common among respondents with eye disease, accounting for 25 respondents or 65.8% of the case group. The distribution therefore indicates that respondents without eye disease tended to demonstrate a more favorable knowledge profile than respondents who had experienced an ocular disorder.

Knowledge represents an important cognitive component of preventive health behavior because individuals require adequate information before they can recognize risks and choose appropriate actions. In eye health, this includes understanding the importance of ocular hygiene, limiting avoidable exposure to irritants, recognizing symptoms that require medical attention, and seeking examination when visual problems persist (Ilyas & Yulianti, 2015). A lack of such understanding may result in delayed treatment or ineffective responses to ocular symptoms. This relationship is particularly relevant for conditions such as conjunctivitis, where appropriate hygiene and awareness of transmission can contribute to prevention and control (Putra et al., 2019).

Previous educational intervention studies support the importance of knowledge enhancement in improving awareness of eye health. Hajar et al. (2019) demonstrated that education regarding refractive disorders increased students' knowledge, indicating that structured health promotion can modify understanding of ocular conditions. Djajanti et al. (2020) similarly reported that eye health education improved adolescents' knowledge, suggesting that educational interventions are effective when information is delivered in an accessible and targeted manner. These findings strengthen the public health relevance of the present results because knowledge is a potentially modifiable factor compared with fixed demographic characteristics such as age and gender.

The relationship between knowledge and preventive behavior has also been documented among individuals at risk of glaucoma. Siswoyo et al. (2018) reported a significant positive correlation between knowledge and glaucoma prevention efforts, indicating that higher knowledge was associated with better preventive behavior. This relationship is clinically important because glaucoma can progress gradually and may cause irreversible optic nerve damage when diagnosis and treatment are delayed (Schuster et al., 2020). Increasing public understanding of chronic and potentially asymptomatic eye disorders is therefore essential because individuals may not seek care when the importance of screening and early detection is poorly understood.

However, the association between knowledge and eye disease occurrence should not be interpreted as evidence that knowledge alone determines whether a person develops an ocular disorder. Eye diseases arise through multiple mechanisms, including infection, aging, refractive changes, degenerative processes, genetic susceptibility, environmental exposure, and other biological factors (Corwin, 2009). For example, cataract primarily involves progressive opacity of the crystalline

lens, whereas glaucoma is associated with optic nerve damage, and conjunctivitis involves inflammation of the conjunctival tissue (Astari, 2018; Dietze et al., 2021). Knowledge is therefore more appropriately viewed as a factor that can influence preventive practices, recognition of symptoms, and timely access to healthcare rather than as a direct biological cause of disease.

The findings also suggest that health literacy interventions should not be limited to individuals with low formal education because substantial gaps in disease-specific knowledge may occur across educational groups. Sari (2017) and Amelia (2017) highlighted the importance of assessing students' understanding of eye health, while Khoirunnisa (2016) examined parental knowledge concerning conjunctivitis in children. Such studies demonstrate that eye health knowledge is relevant across different age, educational, and family contexts. Public education strategies should consequently use multiple channels, including community counseling, schools, family education, primary healthcare services, and accessible written or digital information.

The significant relationships of education and eye health knowledge with eye disease occurrence indicate that cognitive and social factors are important components of community eye health. Primary healthcare facilities can use these findings to strengthen promotive and preventive programs through routine counseling, distribution of educational materials, early screening, and communication regarding warning signs of ocular disease. Puskesmas-based education is particularly appropriate because community health centers are designed to integrate health promotion, prevention, and basic clinical care within their local populations (Putri et al., 2017). Strengthening eye health knowledge across educational groups may therefore support earlier recognition of disease, more appropriate preventive practices, and more timely utilization of eye care services.

Integrated Determinants and Public Health Implications of Eye Disease Occurrence

The overall findings indicate that eye disease occurrence in the Batang III Community Health Center area should be understood as the result of interacting demographic, educational, cognitive, behavioral, and clinical factors rather than a single determinant. The study identified statistically significant associations between eye disease occurrence and age, gender, educational level, and eye health knowledge, suggesting that the pattern of ocular disease within the community reflects a multidimensional public health problem. Such an interpretation is consistent with the broader understanding that health outcomes develop through the interaction of individual characteristics, environmental exposure, access to information, and patterns of healthcare utilization (Masturoh & Anggita, 2018). Epidemiological interpretation therefore requires attention to both biological susceptibility and modifiable factors that can potentially be targeted through preventive interventions (Dahlan, 2016).

The clinical composition of eye disease cases further demonstrates the heterogeneous nature of ocular morbidity in the study population. Conjunctivitis accounted for the largest proportion of identified cases, whereas cataract, glaucoma, and hypermetropia were observed less frequently. These conditions differ substantially in etiology, pathophysiology, clinical progression, and preventive requirements, making a single explanatory model inappropriate for all cases (Corwin, 2009). The coexistence of inflammatory, refractive, degenerative, and optic nerve disorders within one study population therefore supports an integrated approach to community eye health rather than a disease-specific intervention alone.

Conjunctivitis represented the predominant eye disease among respondents, highlighting the importance of ocular hygiene, knowledge of transmission, and timely management of symptoms. Clinical descriptions of conjunctivitis emphasize that inflammatory changes of the conjunctiva may arise from infectious, allergic, or irritative mechanisms and commonly present with redness, discharge, tearing, itching, or discomfort (Albert & Jakobiec, 2015). Studies conducted in Indonesia have similarly documented conjunctivitis as a common outpatient eye condition with diverse clinical characteristics and management requirements (Shakira et al., 2012; Insani et al., 2017). Public understanding of these characteristics is particularly important because inappropriate self-treatment or delayed healthcare seeking may prolong symptoms or facilitate transmission when an infectious cause is present.

Cataract, glaucoma, and refractive problems require a different preventive and clinical approach because their progression and consequences differ from conjunctival disease. Cataract involves loss of lens transparency and remains an important cause of visual impairment, especially

among older adults, while glaucoma is characterized by progressive optic nerve damage that may lead to irreversible vision loss when not detected early (Astari, 2018; Schuster et al., 2020). Refractive abnormalities may also impair visual function when not appropriately corrected, emphasizing the importance of routine visual assessment and access to corrective services (Risma et al., 2022). These differences illustrate why community eye health programs should combine education, early detection, referral, and disease-specific clinical management.

Table 3. Overall Characteristics and Eye Disease Profile of Respondents

Characteristic	Category	n	Percentage (%)
Gender	Male	45	59.2
	Female	31	40.8
Education	Elementary school	5	6.6
	Junior high school	14	18.4
	Senior high school	28	36.8
	Higher education	29	38.2
Eye health knowledge	Good	31	40.8
	Moderate	38	50.0
	Poor	7	9.2
Eye disease status/type	Conjunctivitis	25	32.8
	Cataract	5	6.5
	Glaucoma	1	1.3
	Hypermetropia	4	5.2
	No eye disease	38	50.0

Source: Primary research data from respondents in the Batang III Community Health Center area

The distribution of knowledge levels provides an important basis for preventive action because half of the respondents demonstrated only a moderate level of eye health knowledge, while a smaller proportion had poor knowledge. Although only seven respondents were classified as having poor knowledge, the finding that moderate knowledge predominated suggests that substantial opportunities remain for strengthening community understanding. Previous studies have shown that structured counseling can improve knowledge regarding refractive disorders and general eye health among school-aged populations (Hajar et al., 2019; Djajanti et al., 2020). Educational programs in primary care may therefore be useful not only for individuals with poor knowledge but also for those whose understanding remains incomplete or insufficient for effective preventive behavior.

Knowledge improvement should be translated into practical preventive actions because information alone does not automatically produce healthier behavior. Individuals need to understand how to maintain ocular hygiene, avoid unnecessary eye rubbing, recognize warning signs, use appropriate protective equipment in risky environments, and seek professional assessment when symptoms persist. Research on glaucoma prevention has demonstrated that greater knowledge is positively related to preventive efforts, indicating that cognitive understanding can support healthier responses when it is linked to actionable guidance (Siswoyo et al., 2018). Health education should therefore be designed not merely to transmit information but to facilitate behavioral application in everyday life.

The educational and demographic diversity of respondents also suggests that health messages should be adapted to the literacy, age, occupation, and social context of the target population. Community members with lower levels of formal education may benefit from simple visual materials, face-to-face counseling, and practical demonstrations, whereas individuals with higher educational attainment may respond well to more detailed written or digital information. Educational exposure can influence how people interpret health information, but formal schooling should not be treated as the sole determinant of understanding because knowledge may also be acquired through informal learning and lived experience (Maskhuroh, 2016). Similar variation in knowledge has been observed across school students, university populations, parents, and health-related groups, reinforcing the need for audience-specific education (Sari, 2017; Khoirunnisa, 2016; Trisnawati, 2017).

Community-level eye health promotion should also consider that ocular disease is influenced by environmental and occupational exposure in addition to knowledge and education. Respondents working in outdoor settings or occupations involving dust, ultraviolet radiation, chemicals, or prolonged visual tasks may face different ocular risks from individuals with limited environmental exposure. The function of the eye as a complex sensory organ means that both external irritants and internal physiological processes can contribute to visual disturbances (Sherwood, 2020). Preventive strategies should consequently integrate occupational eye protection, routine examination, symptom recognition, and referral mechanisms rather than relying exclusively on general health education.

The role of the community health center is central in implementing such an integrated strategy because primary healthcare services provide direct access to populations within a defined geographic area. Puskesmas services are intended to emphasize promotive and preventive activities while maintaining access to basic curative care and referral when more specialized management is required (Putri et al., 2017). In the context of eye health, this role can include community education, preliminary visual screening, identification of red-flag symptoms, referral of suspected cataract or glaucoma cases, and counseling regarding hygiene and protective practices. The national emphasis on preventing visual impairment further supports strengthening primary-level detection and education as part of community health programs (Kementerian Kesehatan Republik Indonesia, 2018).

Interpretation of the present findings should nevertheless account for the methodological characteristics of the study. The case-control design is appropriate for evaluating associations between selected exposures and disease status, but it does not establish temporal sequence or causation between knowledge, demographic characteristics, and eye disease occurrence. In addition, the analysis was based on bivariate Chi-square testing, so potential confounding variables such as occupation, socioeconomic status, comorbidities, healthcare access, environmental exposure, or duration of symptoms were not simultaneously adjusted (Arikunto, 2013). Future research could employ multivariable logistic regression or larger community-based samples to estimate the independent contribution of each determinant more accurately.

Taken together, the findings support the development of integrated community eye health interventions that combine education, screening, behavioral prevention, and appropriate referral. Particular attention should be directed toward improving disease-specific knowledge, strengthening early recognition of conjunctivitis and other common ocular conditions, and encouraging routine examination for disorders that may progress without obvious early symptoms. Clinical knowledge regarding cataract, glaucoma, macular degeneration, and other ocular disorders indicates that early detection remains critical because delayed diagnosis may result in persistent or irreversible visual impairment (Stahl, 2020; Dietze et al., 2021). A coordinated strategy through the Batang III Community Health Center may therefore help translate the observed associations between knowledge, education, age, gender, and eye disease occurrence into practical preventive measures for the local population.

CONCLUSION

The study found significant relationships between age, gender, educational level, eye health knowledge, and the occurrence of eye diseases in the Batang III Community Health Center area. Age was significantly associated with eye disease occurrence ($p = 0.026$), followed by gender ($p = 0.044$), educational level ($p = 0.006$), and eye health knowledge ($p = 0.009$). Conjunctivitis was the most frequently identified eye disease among respondents, while individuals with good eye health knowledge were more frequently represented in the group without eye disease. These findings indicate that eye disease occurrence in the community is associated with a combination of demographic and knowledge-related characteristics rather than with a single factor.

The findings emphasize the importance of strengthening eye health promotion and preventive services at the primary healthcare level. Community education should focus on recognizing common eye disease symptoms, maintaining proper eye hygiene, understanding preventable risk factors, and seeking professional examination when ocular complaints persist. The Batang III Community Health Center can integrate eye health education with routine screening and early referral, particularly for groups with moderate or poor knowledge. Further studies with larger samples and multivariable statistical analyses are recommended to evaluate the independent effects of demographic, behavioral, occupational, and environmental factors on eye disease occurrence.

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