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AWARENESS AND KNOWLEDGE OF AMBLYOPIA: A CROSS-SECTIONAL STUDY AMONG MEDICAL STUDENTS IN SAUDI ARABIA.

Essa Alsultan[1*], Rimaz Aldawsari[2], Shaden Al-Sowayeh[3], Abdulla Alobaid[1], Ebtehal Almahdy[1], Lama Althagafi[4], Batool Alhashidi[4], Fadi F Hassanin[5], Khames Alzahrani[6].

[1] Medical student, College of Medicine, King Faisal University, AlAhsa, Saudi Arabia
[2] Medical student, College of Medicine, Jeddah University, Jeddah, Saudi Arabia
[3]Medical student, College of Medicine, Imamu Muhammad Ibn Saud Islamic University, Riyadh, Saudi Arabia.
[4] Medical student, College of Medicine, King Abdulaziz University Hospital, Jeddah, Saudi Arabia.
[5]Department of Ophthalmology, College of Medicine, University of Jeddah, Jeddah, Saudi Arabia
[6]BDS, PGD Endo from Stanford University, Saudi Board of Endodontic, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia

Corresponding author: Essa Alsultan; **Email**: Essa2109@hotmail.com

Abstract

Background: Amblyopia, commonly known as "lazy eye," is a childhood condition marked by reduced vision caused by developmental issues during early years. Detecting it early is crucial for successful treatment, which may involve interventions like eye patches, corrective glasses, or specialized therapies. Without timely intervention, it could lead to irreversible vision impairment. Anisometropia (different refractive errors in each eye) and strabismus (misalignment between the eyes) are primary causes, while conditions like retinopathy of prematurity, corneal trauma, and congenital cataracts can also contribute.
Objectives: This study aimed to assess and measure the level of knowledge and awareness of amblyopia among medical students in Saudi Arabia.
Methods: This was a cross-sectional study, in which data was collected at one point in time. A cross-sectional survey was carried out online starting on June 2023. Data was stored using Microsoft Office Excel and then was analyzed using descriptive statistics.
Results: As regard the knowledge score about amblyopia, 58.5% of respondents fall into the category of poor knowledge. Additionally, only 25.6% of individuals demonstrated a good knowledge level. The fair knowledge segment, accounting for 15.9%. Regarding the awareness score, 23.3% of respondents exhibiting good awareness and 23.0% demonstrating fair awareness. Conversely, a striking 53.7% of respondents are categorized as having poor awareness. Regarding the relation between awareness of amblyopia and sociodemographic characteristics, there was a statistically significant relation to year of studying (p value=0.0001), age (p value=0.0001), personal history of eye disease (p value=0.002), and family history of eye disease (p value=0.003). It also shows statistically insignificant relation to gender, marital status, nationality, current GPA.
Conclusion: this study highlighted a significant gap in knowledge and awareness of amblyopia among medical students in Saudi Arabia, with over half of the respondents categorizing as having poor

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awareness and knowledge of the condition. Despite the pivotal role that medical professionals play in the early detection and intervention of amblyopia, the low levels of understanding regarding its definitions, risk factors, and optimal treatment timelines underscore the need for enhanced educational initiatives. The findings align with previous research indicating that awareness of amblyopia is notably insufficient, even within medical circles.

Keywords: knowledge, awareness, amblyopia, lazy eye, refractive errors, squint, medical students, Saudi Arabia.

Introduction:

Amblyopia is a loss of best-corrected visual acuity brought on by inappropriate vision development in early childhood and adolescence. The phrase, which is also known as "lazy eye," is derived from a Greek word that means dullness of vision [1]. The level of vision loss varies, ranging from minor (20/25 or worse) to severe (20/200 or worse), legal blindness [2]. The early part of the first decade of life is when amblyopia often occurs. Even though there are simple ways to detect this disease, it is typically underreported. If detected early and handled correctly, this condition is curable [3]. If amblyopia is diagnosed after the age of seven to nine years, there is now no therapy available and it may result in irreversible visual impairment [4]. Anisometropia and strabismus, often known as squint, are the two most common causes of the amblyopia. The first could be an entirely distinct refractive error that is present between the two eyes while the second might be an alignment issue between the two eyes [5]. Less frequent causes of amblyopia include retinopathy of prematurity, corneal trauma, corneal dystrophy, congenital cataract, congenital ptosis, and congenital glaucoma. [6]. Different forms of therapy have been suggested for managing amblyopia. They may include different eye patches, glasses, contacts, cycloplegic therapy, dichoptic training.[7].

The reported prevalence of amblyopia is approximately 2% - 5% worldwide [8]. whereas Saudi Arabia has a regional variation in the prevalence of amblyopia, with Riyadh having 2.6% Qassim province 3.9%, Jeddah 1.3%, and Abha having 1.9%. Loss of vision is a major complication of amblyopia, despite the low incidence of the condition [2].

According to a previous study that measure the awareness of amblyopia among medical and dentistry students in Hail university, it was found that 67.5% of participants give correct answer regarding the definition of amblyopia. Students are particularly interested in learning more about complications and how their severity can be managed, and they want to attend awareness programs and continuing education seminars to learn more and acquire the most recent information [9].

The prevalence of amblyopia in Saudi Arabia differs depending on the geographic location. In 1994, the rate of amblyopia among preschool children in Riyadh was recorded at 2.6%. In Abha, the prevalence among school-age children was noted to be 1.9%, while in Al-Baha city, it was found to be 1.6% [10-12]. Furthermore, a study conducted at a private hospital in Dammam revealed that amblyopia accounted for 9.1% of cases, making it a significant cause of eye morbidity in children [13].

Although considerable research on this health condition has been done, there is little information on how well-informed medical students are about amblyopia. Therefore, the purpose of this study was to

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ascertain whether or not media students were aware of amblyopia.

Objectives:
This study aimed to assess and measure the level of knowledge and awareness of amblyopia among medical students in Saudi Arabia.

Materials and Methods:
Study design:
This study was a cross-sectional online survey which was carried out In Saudi Arabia. The study participants were medical students from universities in the Kingdom of Saudi Arabia, and participants were recruited from those who received the questionnaire between June 2023 and September 2024.
Inclusion and Exclusion criteria:
Our inclusion criteria in this study were an adult population aged 18 years old and above who study in medical college in Saudi Arabia.
Our exclusion criteria were people who did not not approve of the study consent, who are below 18 years old, people who were not medical students, or who study outside Saudi Arabia.
Sample size:
A total of 385 individuals, used the formula. n = z2 * p * (1 - p) / e2 where Sample size = n, p = proportion 50%, the confidence level 95%, so Z score = 1.96, margin of error (E)=0.05.
Method for data collection and instrument (Data collection Technique and tools):
The data was collected by distributing a 20-question online survey in English to the target group using Google forms. The survey consisted of 3 main sections, the first section included sociodemographic data such as: current enrolled year, gender, marital status, nationality, and Saudi regions. The second section included even multiple-choice questions assessing various domains of amblyopia awareness and each question had three options (Yes, No, Don't know) and the last section assessed amblyopia knowledge including definition, causes, symptoms, risk factors, complications, and management options.
Scoring system:
The awareness and knowledge were measured in two sections using abattoir laws. The first section measures the awareness in Table 2, including 10 questions. The second section measures the knowledge in Table 3, including 10 questions. The scores ranged from 0 to 10 and were classified for both tables into three levels. Each question was scored as a zero-one indicator (dichotomous) variable, with zero for the wrong answer and one for the right answer. The levels of compliance were defined as follows: 1. good level: 8-10 scores; 2. fair level: 7-8 scores; and 3. poor level: 0-6 scores.
Pilot test:
The questionnaire was distributed on 20 individuals and asked to fill it. This was done to test the simplicity of the questionnaire and the feasibility of the study. Data of the pilot study was excluded from the final data of the study.
Analyzes and entry method:
Data was stored using Microsoft Office Excel (2019). Then was analyzed by Statistical Package for

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Social Sciences (SPSS) version 28.0. The data was analyzed using descriptive statistics such as frequency and percentage, median, and mean, as appropriate, and the results of the analysis were presented in figures.

Results:

Table (1) displays various demographic parameters of the participants with a total number of (434). The distribution of enrollment years indicates a pronounced majority of participants in their fourth year (26.3%), suggesting that upperclassmen are more represented, likely due to their greater availability and ability to participate in studies compared to first-year students, who account for only 10.4% of the sample. Gender distribution reveals a significant skew towards female participants, comprising 62.4% of the total, which may reflect broader trends within educational enrollment patterns or specific program characteristics. The age range is notably concentrated around 21 years and younger, with a mean age of 21.6 years, highlighting a young demographic that is typical in academic environments. Furthermore, marital status indicates a predominantly single population, with unmarried participants constituting 95.2%, which may influence support structures and social dynamics within the student community. In terms of nationality, a remarkable 96.1% of participants are Saudi, which emphasizes the local context of the study. Residential data shows a considerable representation from the Eastern Province and Makkah Province, suggesting potential geographical influences on participant experiences and perspectives. The educational background highlights the academic performance of the sample, with over 61% achieving an 'Excellent' GPA, reflecting a cohort that is likely motivated and high-achieving. This performance, along with the notable proportion of participants with a personal (33.6%) or family history (46.1%) of eye disease, underscores potential areas for further research, especially regarding the intersection of health education and awareness among this population.

Table (1): Sociodemographic characteristics of participants (n=434)

Parameter		***No.***	***Percent (%)***
What year are you currently enrolled in?	First (prep year)	45	10.4
	Second	45	10.4
	Third	79	18.2
	Fourth	114	26.3
	Fifth	79	18.2
	Sixth	72	16.6
Gender	Female	271	62.4
	Male	163	37.6
Age (Mean: 21.6, STD:2.3)	less than 21 years old	115	26.5
	21 years old	78	18.0
	22 years old	115	26.5
	23 years or more	126	29.0
Marital status	Unmarried	413	95.2

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	Married	17	3.9
	Divorced	3	.7
	Widows	1	.2
Nationality	Non-Saudi	17	3.9
	Saudi	417	96.1
Place of residency	Al-Bahah Province	5	1.2
	Al-Jawf Province	4	.9
	Aseer Province	4	.9
	Eastern Province	173	39.9
	Ha'il Province	2	.5
	Jizan Province	3	.7
	Madinah Province	5	1.2
	Makkah Province	124	28.6
	Najran Province	2	.5
	Northern Borders	3	.7
	Qassim Province	10	2.3
	Riyadh Province	97	22.4
	Tabuk Province	2	.5
University	Al Jouf University	4	.9
	Al Qassim University	10	2.3
	Al-Imam Mohammed bin Saud Islamic University	72	16.6
	Batterjee College for Medical Sciences and Technology	7	1.6
	Jazan University	3	.7
	Jeddah University	38	8.8
	King Abdulaziz University	47	10.8
	King Faisal University	172	39.6
	King Khalid University	4	.9
	King Saud bin Abdulaziz University for Health Sciences	15	3.5
	King Saud University	7	1.6
	Tabuk University	2	.5
	Taibah University	2	.5
	Taif University	12	2.8
	Umm Al Qura University	10	2.3
	Other	29	6.7

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Current cumulative grade point average (GPA)?	Excellent [+A OR A] (no less than 3.50 out of 4.00) OR (no less than 4.50 out of 5.00)	268	61.8
	Very good [+B OR B] (From 2.75 to 3.49 out of 4.00) OR (from 3.75 to 4.49 out of 5.00)	121	27.9
	Good [+C OR C] (From 1.75 to 2.74 out of 4.00) OR (from 2.75 to 3.74 out of 5.00)	33	7.6
	satisfactory [+D OR D] (From 1.00 to 1.74 out of 4.00) OR (From 2.00 to 2.74 out of 5.00)	7	1.6
	Less than satisfactory [F] (less than 1.00 out of 4.00) OR (less than 2.00 out of 5.00)	5	1.2
Personal history of eye disease?	No	288	66.4
	Yes	146	33.6
Family history of eye disease?	No	234	53.9
	Yes	200	46.1

As shows in figure 1, The data presented in the figure reflects a significant awareness gap regarding amblyopia among medical students in Saudi Arabia. With a total of 434 respondents, it is noteworthy that a substantial majority, 285 medical students, affirmed that they have heard of amblyopia, indicating a moderate level of awareness within this population. However, the fact that 119 medical students reported not having heard of the condition, coupled with the 30 individuals who indicated uncertainty by answering "I don't know," underscores a critical area that necessitates further educational outreach and intervention. This discrepancy suggests that while some medical students are informed about amblyopia, there remains a considerable segment of the population that either lacks fundamental knowledge about this visual disorder or is oblivious to its implications.

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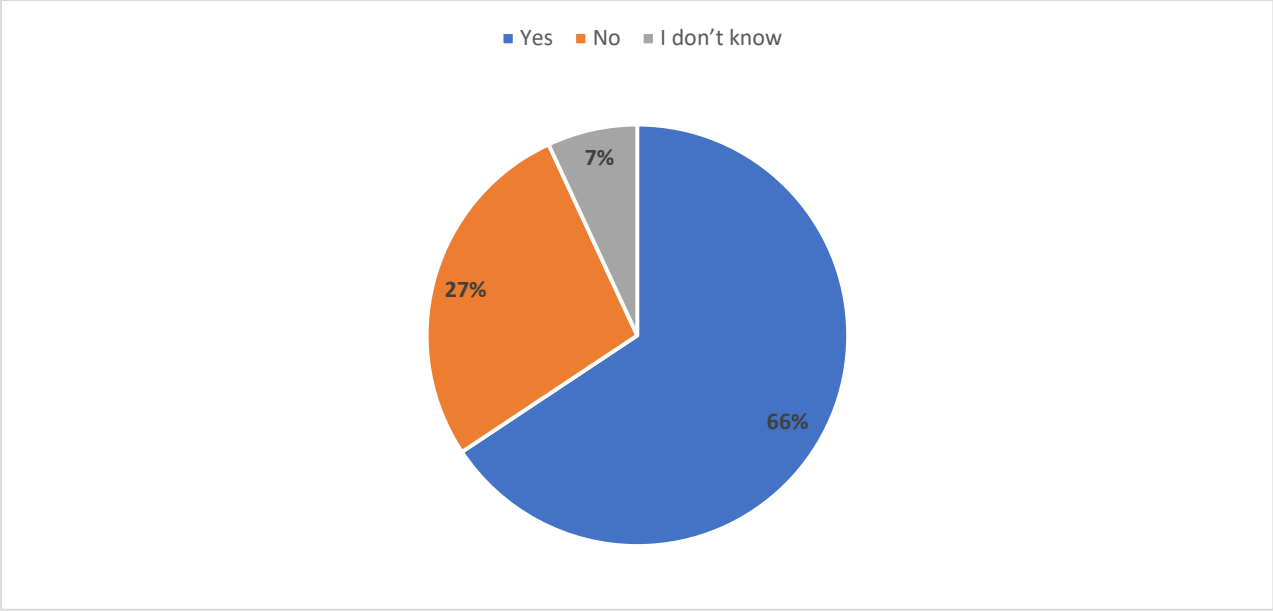
Figure (1): Illustrates if participants know about amblyopia.



As illustrated in table (2), The data presented in Table (2) offers insightful revelations concerning public awareness of amblyopia, as evidenced by responses from a diverse sample of 434 participants. Notably, 65.7% of individuals reported having heard of amblyopia, underscoring a substantial level of baseline awareness among the population; however, 27.4% remained unaware, and 6.9% expressed uncertainty regarding their knowledge. When prompted about the detectability of amblyopia by naked eye assessment, a significant portion (40.3%) indicated affirmation, yet a considerable fraction (31.1%) were uncertain, highlighting a potential need for increased educational outreach regarding the visual screening capabilities regarding this condition. Additionally, perspectives regarding the diagnostic roles of healthcare professionals revealed mixed sentiments: while 40.8% agreed that general pediatricians or family doctors could diagnose amblyopia, an alarming 36.2% were unsure, indicating a gap in knowledge that could affect timely referrals to specialists. On the issue of treatment windows, 57.8% accurately identified that the optimal period for amblyopia intervention lies between the ages of three to nine years, yet a significant minority expressed confusion or misinformation regarding appropriate treatment timelines. The overwhelming consensus (85.9%) emphasized the necessity of early vision checks for child development, showcasing an understanding of preventative healthcare strategies. An impressive 77% acknowledged the potential detrimental impact of amblyopia on a child's life, underscoring the public's recognition of its severity; however, misconceptions persist, as evidenced by the 45.2% who incorrectly believed that amblyopia could not be treated spontaneously. Overall, while the data indicates a commendable level of awareness and concern regarding amblyopia, it also highlights critical areas for improvement in public education and understanding of both the condition's gravity and the role of healthcare professionals in early diagnosis and management.

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Table (2): Parameters related to awareness of amblyopia (n=434).

Parameter		***No.***	***Percent (%)***
Have you ever heard of amblyopia?	Yes	285	65.7
	No	119	27.4
	I don't know	30	6.9
Amblyopia can be detected by the naked eye.	Yes	175	40.3
	No	124	28.6
	I don't know	135	31.1
Amblyopia can be diagnosed by a general pediatric or family doctor.	Agree	177	40.8
	Disagree	100	23.0
	I don't know	157	36.2
Amblyopia can only be diagnosed by an eye specialist.	Agree	168	38.7
	Disagree	143	32.9
	I don't know	123	28.3
Amblyopia is a disease in?	Adults	22	5.1
	Children	171	39.4
	Both	241	55.5
What is the best age period for the treatment of amblyopia?	Before age of a year	61	14.1
	Between three and nine years	251	57.8
	After the age of 10 years	23	5.3
	There is no specific period	99	22.8
Is it important to check a child's vision before school for normal development?	Yes	373	85.9
	No	14	3.2
	I don't know	47	10.8
Amblyopia is a serious condition.	Yes	271	62.4
	No	58	13.4
	I don't know	105	24.2
Amblyopia can treat spontaneously	Yes	77	17.7
	No	196	45.2
	I don't know	161	37.1
Amblyopia can impact the child's life.	Yes	334	77.0
	No	24	5.5
	I don't know	76	17.5

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Figure (2) offers valuable insights into the knowledge of amblyopia among medical students in Saudi Arabia, highlighting their perceptions regarding the optimal age for treatment. It is noteworthy that a significant majority of respondents, 251 participants, believe that the best age period for addressing amblyopia lies between three and nine years. This perspective aligns with established pediatric ophthalmological guidelines, which recommend early intervention during this critical developmental window to maximize visual outcomes. Conversely, only 61 respondents indicated that treatment should commence before the age of one, suggesting a potential gap in understanding the importance of early detection and intervention. Furthermore, a minority of 23 respondents suggested that treatment should begin after the age of ten, which may reflect a lack of awareness about the diminishing efficacy of amblyopia treatment beyond early childhood. Additionally, the 99 medical students who opined that there is no specific treatment period could indicate a broader misunderstanding of amblyopia.

Figure (2): Illustrates best age period for treating amblyopia according to participants.

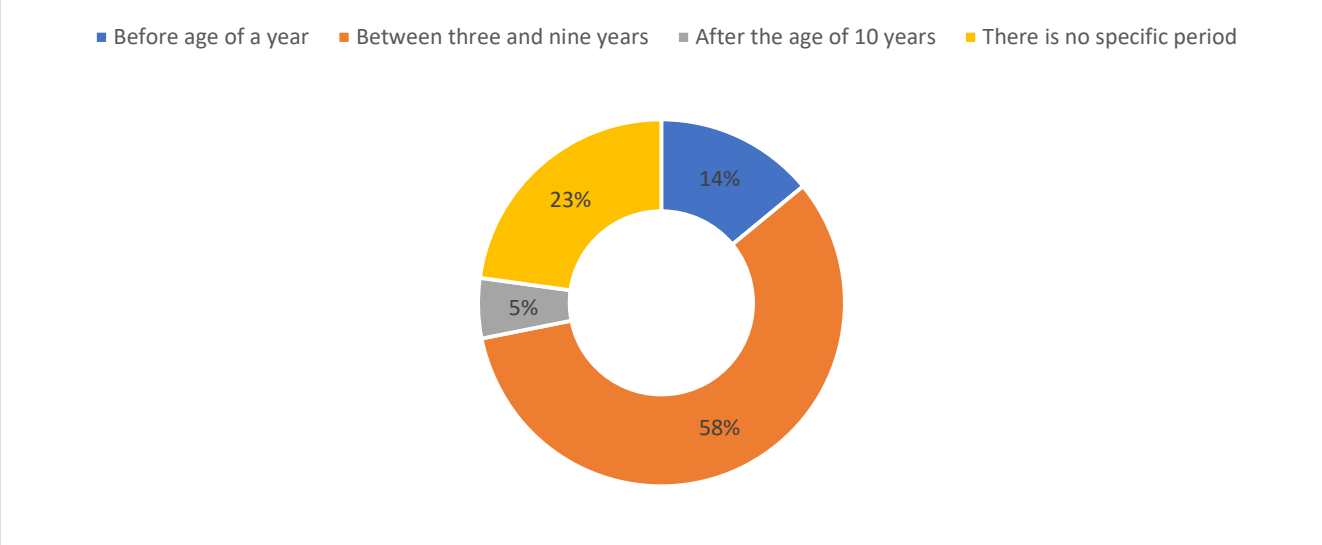

Table (3) reveals valuable insights into the knowledge and understanding of amblyopia among the 434 participants surveyed. Notably, it is evident that a significant portion of the respondents (36.2%) accurately identified amblyopia as a condition where the eye and brain do not work together effectively, suggesting a foundational comprehension of the disorder's nature. However, confusion persists, as only 12.9% correctly defined amblyopia as decreased vision in one or both eyes, indicating a gap in precise knowledge that could hinder early diagnosis and intervention. When it comes to the etiology of amblyopia, hereditary factors were recognized by 44.2% of participants, followed closely by refractive errors at 41.0%, highlighting the importance of recognizing genetic predispositions and visual impairments in understanding the disorder. In terms of risk factors, an overwhelming 70.5% identified strabismus, reflecting its prominence as a major contributing factor. Complications associated with amblyopia, such as permanent vision loss, were acknowledged by 59.4% of respondents, yet a considerable 28.6% expressed uncertainty about the potential consequences, which underscores the

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necessity for enhanced educational initiatives. In addressing treatment options, the predominance of knowledge surrounding patching the healthy eye (45.6%) contrasts sharply with the mere 4.8% who deemed spontaneous resolution as a viable outcome, highlighting a critical area for improvement in public awareness. Furthermore, the strong belief (70.5%) in the possibility of curing amblyopia with early treatment suggests optimism and awareness that could be leveraged for advocacy in early detection and intervention strategies.

Table (3): participants' knowledge regarding amblyopia (n=434).

Parameter		***No.***	***Percent (%)***
What is the definition of Amblyopia?	Abnormal eye movement	12	2.8
	Decreased night vision	7	1.6
	Decreased vision in one or both eyes	56	12.9
	Degeneration of the optic nerve	14	3.2
	Inability of the eye to move	8	1.8
	Misalignment of an eye	22	5.1
	Misalignment of both eyes	10	2.3
	The eye and brain not working well together	157	36.2
	Two eyes don't line up in the same direction	76	17.5
	Vision loss in one eye	33	7.6
	Other	39	9.0
What are the etiology / etiologies of Amblyopia? *	Cataract	133	30.6
	Hereditary cause	192	44.2
	Refractive error	178	41.0
	Trauma	129	29.7
	Cerebral palsy	102	23.5
	Down syndrome	66	15.2
	Nutrition deficiency	67	15.4
	Electronic device use	67	15.4
	Fever in infancy	76	17.5
	Maternal illness Prematurity	144	33.1
	Other	85	19.6
What are the Risk Factors of Amblyopia? *	Family history (1st degree relatives) of congenital cataract or strabismus	262	60.3
	One of the parents has or had congenital cataract	166	38.2
	droopy eyelids	166	38.2
	strabismus	306	70.5
	Myopia	166	38.2
	Hyperopia	166	38.2

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	Premature birth	99	22.8
What are the complications of Amblyopia? *	Permanent and irreversible vision loss in the affected eye	258	59.4
	Permanent and irreversible vision loss in both eyes.	48	11.0
	Loss of 3-dimensional (3D) perception.	115	26.5
	I don't know	124	28.6
What is the treatment of Amblyopia?	Resolves spontaneously	21	4.8
	Laser therapy	46	10.6
	Patch on the healthy eye	198	45.6
	Eye muscle exercise	32	7.4
	Glasses	61	14.1
	Surgery is the best treatment	76	17.5
What are the symptoms of amblyopia? *	Poor visio1n in one eye	256	59.0
	Get closer to TV or bringing objects close from the eye when looking at them	129	29.7
	Clear squint	121	27.9
	Taking a position and tilting the head to one side while looking to objects	163	37.5
	Headache or eye stress	141	32.4
	Do not know	90	20.7
Sources of knowledge about amblyopia *	Books	191	44.0
	Awareness campaigns	69	15.9
	Doctor	235	54.1
	Internet/social media	163	37.5
	Relatives/friends	111	25.5
What is the best age to diagnose amblyopia?	2 years	157	36.2
	3 years	162	37.3
	4 years	59	13.6
	5 years	56	12.9
What can be done to prevent amblyopia?	Early detection and treatment of strabismus and refractive errors	245	56.5
	Making sure that children have adequate lighting when they read or do other activities that require good vision	55	12.7
	Regular eye exams for children	134	30.9
What is the prognosis for amblyopia?	Amblyopia can be cured if treated early.	306	70.5
	Amblyopia can be improved with treatment, but it may not be cured.	100	23.0

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Amblyopia cannot be cured.	28	6.5

Results may overlap

The data presented in Table 4 offers a compelling insight into the knowledge levels regarding amblyopia among the surveyed population. Notably, the results indicate that a significant majority, comprising 58.5% of respondents, fall into the category of poor knowledge regarding amblyopia, which underscores a pressing need for enhanced educational interventions in this area. Additionally, only 25.6% of individuals demonstrated a good knowledge level, which is concerning given the importance of early detection and treatment of amblyopia to prevent potential long-term visual impairment. The fair knowledge segment, accounting for 15.9% of the total, further highlights a gap in understanding that could benefit from targeted awareness campaigns and community outreach programs. The total number of participants surveyed amounted to 434, providing a robust data set for analysis.

Table (4): Shows knowledge about amblyopia score results.

	Frequency	**Percent**
Good knowledge level	111	25.6
Fair knowledge	69	15.9
Poor knowledge	254	58.5
Total	434	100.0

The data presented in Table 5 provides significant insights into the awareness levels concerning amblyopia within the surveyed population, revealing a concerning overall trend. With only 23.3% of respondents exhibiting good awareness and a slightly lower proportion, 23.0%, demonstrating fair awareness, it is apparent that a combined total of merely 46.3% of the population possesses at least a reasonable understanding of amblyopia. Conversely, a striking 53.7% of respondents are categorized as having poor awareness, indicating a critical gap in knowledge that could hinder early detection and intervention for this visual condition. This predominantly low level of awareness underscores the necessity for targeted educational initiatives aimed at enhancing public understanding of amblyopia, its implications, and the importance of early diagnosis and treatment. Such efforts may prove vital in not only elevating awareness but also in combating the adverse long-term effects that amblyopia may have on vision if left unaddressed.

Table (5): Shows awareness about amblyopia score results.

	Frequency	**Percent**
Good awareness	101	23.3
Fair awareness	100	23.0
Poor awareness	233	53.7
Total	434	100.0

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Table (6) shows that awareness of amblyopia has statistically significant relation to year of studying (p value=0.0001), age (p value=0.0001), personal history of eye disease (p value=0.002), and family history of eye disease (p value=0.003). It also shows statistically insignificant relation to gender, marital status, nationality, current GPA.

Table (6): Relation between awareness of amblyopia and sociodemographic characteristics.

Parameters		***Awareness of amblyopia***		***Total (N=434)***	***P value****
		Good or fair awareness	**Poor awareness**		
Gender	Female	122	149	271	0.485
		60.7%	63.9%	62.4%	
	Male	79	84	163	
		39.3%	36.1%	37.6%	
What year are you currently enrolled in?	First (prep year)	12	33	45	0.0001
		6.0%	14.2%	10.4%	
	Second	9	36	45	
		4.5%	15.5%	10.4%	
	Third	30	49	79	
		14.9%	21.0%	18.2%	
	Fourth	64	50	114	
		31.8%	21.5%	26.3%	
	Fifth	42	37	79	
		20.9%	15.9%	18.2%	
	Sixth	44	28	72	
		21.9%	12.0%	16.6%	
Age	less than 21 years old	32	83	115	0.0001
		15.9%	35.6%	26.5%	
	21 years old	42	36	78	
		20.9%	15.5%	18.0%	
	22 years old	54	61	115	
		26.9%	26.2%	26.5%	
	23 years or more	73	53	126	
		36.3%	22.7%	29.0%	
Marital status	Unmarried	194	219	413	0.336
		96.5%	94.0%	95.2%	
	Married	5	12	17	
		2.5%	5.2%	3.9%	
	Divorced	2	1	3	

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		1.0%	0.4%	0.7%	
	Widowed	0	1	1	
		0.0%	0.4%	0.2%	
Nationality	Non-Saudi	8	9	17	0.950
		4.0%	3.9%	3.9%	
	Saudi	193	224	417	
		96.0%	96.1%	96.1%	
Current cumulative grade point average (GPA)?	Excellent [+A OR A] (no less than 3.50 out of 4.00) OR (no less than 4.50 out of 5.00)	129	139	268	0.472
		64.2%	59.7%	61.8%	
	Very good [+B OR B] (From 2.75 to 3.49 out of 4.00) OR (from 3.75 to 4.49 out of 5.00)	52	69	121	
		25.9%	29.6%	27.9%	
	Good [+C OR C] (From 1.75 to 2.74 out of 4.00) OR (from 2.75 to 3.74 out of 5.00)	17	16	33	
		8.5%	6.9%	7.6%	
	satisfactory [+D OR D] (From 1.00 to 1.74 out of 4.00) OR (From 2.00 to 2.74 out of 5.00)	2	5	7	
		1.0%	2.1%	1.6%	
	Less than satisfactory [F] (less than 1.00 out of 4.00) OR (less than 2.00 out of 5.00)	1	4	5	
		0.5%	1.7%	1.2%	
Personal history of eye disease?	No	118	170	288	0.002
		58.7%	73.0%	66.4%	
	Yes	83	63	146	
		41.3%	27.0%	33.6%	
Family history of eye disease?	No	93	141	234	0.003
		46.3%	60.5%	53.9%	
	Yes	108	92	200	
		53.7%	39.5%	46.1%	

****P value was considered significant if ≤ 0.05.***

Table (7) shows that knowledge of amblyopia among participants has statistically significant relation to the year of enrolment (p value=0.0001), age (p value=0.0001), and family history of eye disease (p value=0.011). It also shows statistically insignificant relation to gender, marital status, nationality,

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current GPA and personal history of eye disease.

Table (7): Knowledge of amblyopia in association with sociodemographic characteristics.

Parameters		***Knowledge of amblyopia***		***Total (N=434)***	***P value****
		Good or fair knowledge level	**Poor knowledge level**		
Gender	Female	107	164	271	0.278
		59.4%	64.6%	62.4%	
	Male	73	90	163	
		40.6%	35.4%	37.6%	
What year are you currently enrolled in?	First (prep year)	3	42	45	0.0001
		1.7%	16.5%	10.4%	
	Second	12	33	45	
		6.7%	13.0%	10.4%	
	Third	23	56	79	
		12.8%	22.0%	18.2%	
	Fourth	56	58	114	
		31.1%	22.8%	26.3%	
	Fifth	39	40	79	
		21.7%	15.7%	18.2%	
	Sixth	47	25	72	
		26.1%	9.8%	16.6%	
Age	less than 21 years old	27	88	115	0.0001
		15.0%	34.6%	26.5%	
	21 years old	36	42	78	
		20.0%	16.5%	18.0%	
	22 years old	50	65	115	
		27.8%	25.6%	26.5%	
	23 years or more	67	59	126	
		37.2%	23.2%	29.0%	
Marital status	Unmarried	174	239	413	0.281
		96.7%	94.1%	95.2%	
	Married	4	13	17	
		2.2%	5.1%	3.9%	
	Divorced	1	2	3	
		0.6%	0.8%	0.7%	
	Widowed	1	0	1	

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		0.6%	0.0%	0.2%	
Nationality	Non-Saudi	8	9	17	0.634
		4.4%	3.5%	3.9%	
	Saudi	172	245	417	
		95.6%	96.5%	96.1%	
Current cumulative grade point average (GPA)?	Excellent [+A OR A] (no less than 3.50 out of 4.00) OR (no less than 4.50 out of 5.00)	118	150	268	0.653
		65.6%	59.1%	61.8%	
	Very good [+B OR B] (From 2.75 to 3.49 out of 4.00) OR (from 3.75 to 4.49 out of 5.00)	47	74	121	
		26.1%	29.1%	27.9%	
	Good [+C OR C] (From 1.75 to 2.74 out of 4.00) OR (from 2.75 to 3.74 out of 5.00)	11	22	33	
		6.1%	8.7%	7.6%	
	satisfactory [+D OR D] (From 1.00 to 1.74 out of 4.00) OR (From 2.00 to 2.74 out of 5.00)	2	5	7	
		1.1%	2.0%	1.6%	
	Less than satisfactory [F] (less than 1.00 out of 4.00) OR (less than 2.00 out of 5.00)	2	3	5	
		1.1%	1.2%	1.2%	
Personal history of eye disease?	No	114	174	288	0.261
		63.3%	68.5%	66.4%	
	Yes	66	80	146	
		36.7%	31.5%	33.6%	
Family history of eye disease?	No	84	150	234	0.011
		46.7%	59.1%	53.9%	
	Yes	96	104	200	
		53.3%	40.9%	46.1%	

****P value was considered significant if ≤ 0.05.***

Discussion:

Amblyopia is a leading cause of visual impairment among young individuals [14]. This condition arises from atypical visual development during early life, which leads to inadequate stimulation of the nerve pathways connecting the eye to the brain. As a result, the vision in one eye becomes weaker due to

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receiving fewer visual signals [15]. Various factors contribute to the risk of developing amblyopia, such as refractive errors, strabismus that interferes with the development of binocular vision, and media opacification. Additionally, early onset cataracts, vitreous hemorrhage, corneal opacities, and ptosis are frequently observed causes of amblyopia. The prevalence of amblyopia across different regions of Saudi Arabia varies: it is reported at 2.6% in Riyadh [16], 3.9% in Qassim province [17], 1.3% in Jeddah [18], and 1.9% in Abha [19]. A significant lack of awareness about eye care in developing nations has caused considerable delays between the appearance of symptoms and clinical diagnosis. Even in developed countries, the understanding of amblyopia appears to be relatively limited.

A lack of knowledge and awareness among healthcare personnel can adversely affect the management outcome and have an adverse impact on amblyopic children needing attention. Thus, we aimed in this study to assess the level of knowledge and awareness of amblyopia among medical students in Saudi Arabia.

Most of the earlier research focused on parents and the broader population. In Saudi Arabia, awareness of amblyopia was found to be 10% within the general public, while it was 50% among individuals visiting pediatric and ophthalmology clinics [20].

As regard the knowledge score about amblyopia among the studied medical students, we have found that 58.5% of respondents, fall into the category of poor knowledge. Additionally, only 25.6% of individuals demonstrated a good knowledge level. The fair knowledge segment, accounting for 15.9%. Regarding the awareness score, 23.3% of respondents exhibiting good awareness and 23.0% demonstrating fair awareness, it is apparent that a combined total of merely 46.3% of the population possesses at least a reasonable understanding of amblyopia. Conversely, a striking 53.7% of respondents are categorized as having poor awareness. Additionally, (36.2%) accurately identified amblyopia as a condition where the eye and brain do not work together effectively, 12.9% correctly defined amblyopia as decreased vision in one or both eyes. Regarding the etiology of amblyopia, hereditary factors were recognized by 44.2% of participants, followed closely by refractive errors at 41.0%. Moreover, 70.5% identified strabismus as a risk factor for amblyopia. Furthermore, 57.8% accurately identified that the optimal period for amblyopia intervention lies between the ages of three to nine years. Another study in Hail, Saudi Arabia conducted by Almutairi et al (2022) [21] had included 496 of the general population and the majority of them had a university degree showed that the median knowledge score of participants was 4 (out of 9). They found a significantly poor awareness and knowledge compared to other big cities in the same country such as Riyadh and Jeddah.

On the contrary, Jaber B. A. et al (2022) [22] conducted a cross-sectional study among ophthalmologists showing clinical practice and attitude regarding amblyopia in Jordan found that although the majority of the participants were less experienced overall, they had a good knowledge of the amblyopia age group and the method of examination. Still, there was a mixed response regarding the treatment. Another study showed level of awareness about amblyopia and related disease dimensions among companions of children attending the pediatrics and ophthalmology clinic in Jeddah [23] which showed amblyopia awareness rate of 49.7%.

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Conclusion:

In conclusion, this study revealed a concerning gap in knowledge and awareness of amblyopia among medical students in Saudi Arabia, with over half of the respondents demonstrating poor understanding of the condition. Although certain aspects of amblyopia were recognized, such as significant risk factors and the critical timeline for intervention, the overall level of awareness remains inadequate. Given that early detection and treatment are vital for preventing irreversible visual impairment, it is imperative to enhance educational initiatives targeting amblyopia within medical curricula. By addressing these knowledge deficiencies, we can improve future healthcare professionals' ability to recognize, diagnose, and treat amblyopia effectively, ultimately promoting better patient outcomes in pediatric eye health.

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Ethics approval consideration:

An informed consent was obtained from each participant after explaining the study in full and clarifying that participation is voluntary. Data collected were securely saved and used for research purposes only. Institutional research ethics board approval was acquired before conducting any study-related procedures. Ethical approval was obtained from Research Ethics Committee of King Faisal University with the IRB approval number (KFU-REC-2024-MAY-ETHICS2244).

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Conflict of interests

The authors declare that there are no conflicts of interest.

Informed consent:

Written informed consent was obtained from all individual participants included in the study.

Data and materials availability

All data associated with this study are present in the paper.

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