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RESEARCH ARTICLE

A COUNTRY-WIDE SURVEY ON KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT CAUSES AND MANAGEMENT TOWARDS AMBLYOPIA AMONG SAUDI POPULATION

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Abstract

Objectives: To investigate the knowledge, attitude, and practice of Saudi population towards amblyopia on a national level.

Methods: An observational cross-sectional study was conducted in 2018 among people who were aged ≥ 18 years from all regions of Saudi Arabia by using online self-administered questionnaire. The survey consisted of three main sections; 1) sociodemographic data, personal and family history of eye diseases; 2) knowledge questions and 3) attitude and practice questions. A survey link was used to collect data which also included an informed consent to be read and approved by the participant.

Results: We interviewed 2001 Saudi nationals (24.7% men, 75.3% women), with mean age of 32.0 (±11.6) years.Seventy-three-point nine percent of the participants had no knowledge of amblyopia, while 26.1% had heard of it and knew its correct definition. Of those, 23.4% believe it can be attributed to genetics, 20.3% believe it can be caused by refractive errors and strabismus, and 45.9% are unsure whether it can be treated or cured. According to 25.8% of respondents, the media is the most common source of information on amblyopia. Eye exercises, surgery, medications and patching the good eye were perceived as treatment options by 21.3%, 20.3%, 17.0% and 17.5% of the participants, respectively. Although 49.2% are unaware of what age amblyopia can be treated, 22.8% believe that amblyopia can be treated after the age of 18.

Conclusion: Our study showed that Saudi citizens have low level of awareness and inadequate knowledge about amblyopia, its causes, management and importance of early detection.

Introduction:-

Globally, 19 million children under 15 years of age are visually impaired, of whom 12.8 million are visually impaired due to uncorrected refractive errors[1,2]. Therefore, uncorrected refractive errors account for nearly two-thirds of all cases of visual impairment in children. The Baltimore Pediatric Eye Disease Study (BPEDS) and Multi-Ethnic Pediatric Eye Disease Study (MEPEDS) conducted among six-month to 72-month-old children identified uncorrected refractive error as the leading cause of visual impairment and amblyopia[3-7]. As the name suggests,

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amblyopia refers to a condition where a child lacks the development of central vision without any brain or ocular abnormality, resulting in a decrease in best-corrected visual acuity (BCVA) unilaterally or bilaterally[8,9]. As a result of its prevalence among children, it poses an important public health problem, given that if corrective measures are not taken at a critical developmental time, amblyopia can lead to lifelong visual impairment[8-10].

Uncorrected anisometropia, high refractive errors, congenital or acquired media opacities, strabismus, and congenital ptosis are predisposing factors for amblyopia. In both BPEDS and MEPEDS studies, amblyopia was found in 1% to 4% of American, African-American, Hispanic preschoolers[3-7,11]. Varma et al., (2012) found that the prevalence of refractive errors, anisometropia, tropias, media opacity, and decreased vision in children aged 36 – 60 months was 25.3%[12]. Similarly, studies such as Vision in Preschoolers (VIP), MEPEDS and the BPEDS evaluated the risk factors for unilateral and bilateral amblyopia in three to five-year-old preschoolers. Ninety-one percent of children with unilateral amblyopia had strabismus, hyperopia of ≥ +2.00 diopters (D), astigmatism of ≥ 1.00 D, or anisometropia of ≥ 0.50 D. Bilateral hyperopia of ≥ +3.00 D and astigmatism of ≥1.00 D was present in 76% of children with bilateral amblyopia. Amblyopia, therefore, requires early detection and treatment[11,12].

The pooled prevalence rate of amblyopia was found to be 1.44%, from meta-analysis of 60 studies, worldwide[12].The prevalence in Saudi Arabia varies by region: 2.6% in Riyadh[13],3.9% in Qassim[14], 1.3% in Jeddah[15], and 1.9% in Abha[16].The number of people worldwide with amblyopia is estimated to increase from 99.2 million in 2019 to 175.2 million and 221.9 million by 2030 and 2040, respectively[17]. The prevalence of amblyopia is often underestimated due to a lack of public awareness regarding uncorrected refractive errors in children and delayed referral to ophthalmologists. Public misconception and lack of information negatively affect the presenting age of amblyopia and its management. Currently, few studies have assessed community awareness of amblyopia. The aim of this study was to determine the level of knowledge, attitude, and practices that the general public has regarding amblyopia in Saudi Arabia.

Materials And Methods:-

This is an observational, descriptive cross-sectional study conducted from April to August 2018 which included all the regions of Saudi Arabia. Prior to data collection, an ethical approval was gained from the institutional review board (IRB) in Qassim region of KSA. Our inclusion criteria were participants with Saudi nationality, aged 18 years and older, who understood the content of the survey and were willing to participate. Hence, we needed 663 participants in order to represent the target population with a confidence level of 99% and margin of error of 5%. The study was conducted in accordance with Declaration of Helsinki. Informed consent was obtained from each participant after explaining the nature of the study and keeping their responses and identity anonymous. Completion of the informed consent form and questionnaire was considered as consent to participate in the study. Public participation in this study was totally voluntary.Participants had the right to withdraw from the study at any time. Confidentiality was maintained throughout the study and respondents were assured that their responses would only be used by the researchers for research purposes. We researchers adhered to the rules and regulations of the National Committee on Bioethics and Medical Ethics (http://bioethics. kacst.edu.sa), and the study was approved by the authorities of the Research Department of the College of Medicine.

An English and Arabic questionnaire was prepared by the researchers as a research instrument using Google-form, based on an intensive literature review (Appendices 2 and 3 for the English and Arabic questionnaires, respectively). [Link for English Questionnaire https://docs.google.com/forms/d/e/1FAIpQLSfNZHGmP5ueTO4QTuN-EV68odmH23FcFhQQzjVyN54AWqmQ5A/viewform]. [Link for Arabic Questionnaire https://docs.google.com/forms/d/e/1FAIpQLSc0BpgXcSyg7xNtyjmMtiElaxkUp5-KMbkDESDfPYckP_z1mA/viewform?usp=pp_url]

Given the high internet usage among people in the KSA, a link to the survey was distributed to respondents, via Twitter, e-mails and WhatsApp groups. The questionnaire consisted of three parts: I. Participant demographics such as age, sex, region, education level, employment, marital status, family history of eye disease, and personal experience with eye disease, including use of glasses/contact lenses, type of refractive error, and behavior in seeking ophthalmic care (1 to 10 questions). II. Awareness of definition of amblyopia, possible etiologies, treatment options, source of information such as social media, internet, cultural meetings, doctors, nurses, friends and relatives, books etc. (11 to 17 questions). III. Attitude and perception about complications of amblyopia, age of onset, early treatment for better outcome, type of impact if its untreated, recovery from amblyopia, effects of amblyopia on family members, and the options to prevent the amblyopia development (18 to 23 questions). Data

was collected using a self-administered questionnaire. All information obtained from the participant was coded by a serial number in SPSS and the analysis process was held by investigators only.

Data analysis:
Descriptive statistic was presented in tables and numeric data as mean and ± standard deviation (SD). Chi-square analysis was used to assess the most common factors associated with a higher knowledge scoreabout amblyopia and the Fisher exact test was used in cases of small numbers. All these statistics was carried on SPSS software version 25 and acceptable statistical significance was $p < 0.05$ between variables.

Results:-

1) Sociodemographic Profile

The first section of the questionnaire covered sociodemographic factors and the general characteristics of participants. Two thousand one participants responded to the survey and the mean age ± SD was 32.0 ± 11.6 years. Of the 2001, 1507 (75.3%) were females. The distribution of participants from five regions was adequate and most of the participants were from the western region of the country 760 (37.9%), followed by the central 438 (21.8%), the eastern 372 (18.6%), the northern 339 (16.9%) and the southern region 92 (4.6%).Twenty-three (1.2%) respondents were semiliterate (had a school education between Standard 2 and 4; so, they could read and fill out the survey), 400(20.0%) had school education and 1578 (78.9%) had higher education at college and post graduate level. In addition, 1017 (50.8%) were married, 1208 (60.4%) were homemakers and/or unemployed, 96 (4.8%) were medical practitioners/physicians. The population characteristics were shown in Table 1.

Table 1:- Demographic Data of survey responders (N=2001) in Kingdom of Saudi Arabia.

Variables		Frequency (N)	Percentage (%)
Age (32.0 ± 11.6) years			
Gender	Male	494	24.7
	Female	1507	75.3
Region	Central	438	21.8
	West	760	37.9
	Eastern	372	18.6
	North	339	16.9
	South	92	4.6
Education level	Semiliterate	23	1.2
	primary	14	0.7
	preparatory	53	2.6
	secondary	333	16.6
	College	1439	71.9
	Post-graduate	139	6.9
Type of occupation	Health	152	7.6
	Army	74	3.7
	Education	414	20.7
	Other	153	7.6
	Unemployed/ homemakers	1208	60.4
Marital status	Single	901	45.0
	Married	1017	50.8
	Divorced	55	2.7
	Widowed	28	1.4
Occupation related to healthcare	Medical practitioner/physician	96	4.8
	Pharmacist		
	Nurse	3	0.2
	Other	11	0.6
		42	2.1

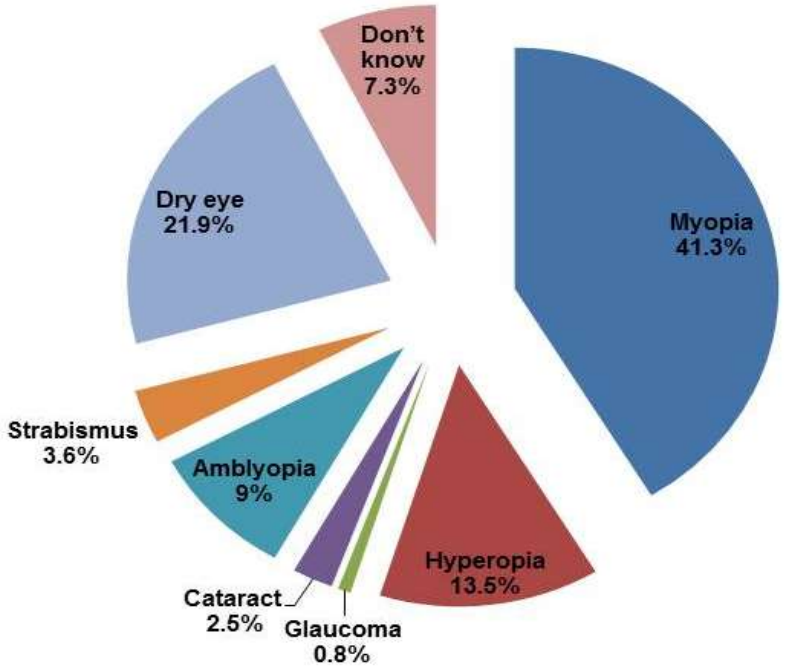
2) Ocular profile

To assess the ocular profile of the participants and determine whether there is any association between knowledge of amblyopia and personal and family experiences with eye disorders, six questions were added to the questionnaire. Of 2001 respondents, 903 (45.1%) had a visual impairment and used glasses or contact lenses, and 899 (44.9%) had an eye related disease in the past. From 899 participants who had a past ocular complaint, 714 (79.4%) sought treatment [510 (71.4%) participants had completed the recommended treatment and kept their appointments, whereas 204 (28.6%) did not complete follow-up appointments and treatment], and 185 (20.6%) did not seek treatment (Table 2). In the 899 participants with past ocular complaints, 477 (41.3%) participants reported myopia, 252 (21.9%) participants reported dry eyes, 156 (13.5%) respondents reported hyperopia, 104 (9.0%) participants reported amblyopia, 42 (3.6%) participants reported strabismus, 29 (2.5%) participants reported cataract and nine participants (0.8%) reported glaucoma. Eighty-four (7.3%) participants did not report any previous eye conditions (Figure 1).

Table 2:- Survey about Ocular profile of study participants, KSA.

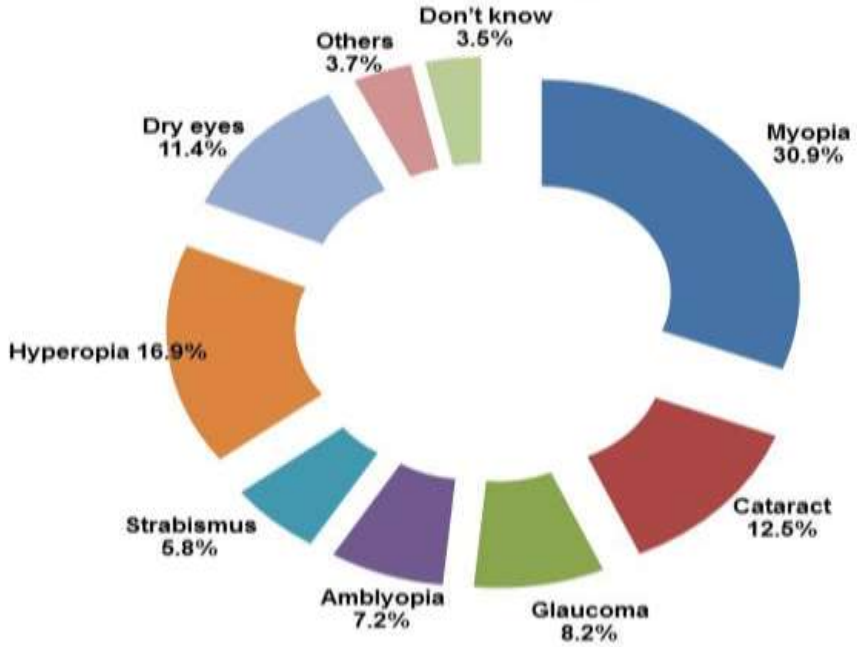
Variables		**Frequency (N)**	**Percentage (%)**
Eye glasses/contact lens use	Yes	903	45.1
	No	1098	54.9
Do you have eye problems	Yes	899	44.9
	No	1102	55.1
If yes, what is that eye problem	Myopia	477	41.3
	Hyperopia	156	13.5
	Glaucoma	9	0.8
	Cataract	29	2.5
	Amblyopia	104	9.0
	Strabismus	42	3.6
	Dry eye	252	21.9
	Don't know	84	7.3
Have you sought treatment for eye disorder	Yes	714	79.4
	No	185	20.6
Are you regularly following treatments and appointments	Yes	510	71.4
	No	204	28.6
Do you know a family member with eye problems	Yes	1301	65.0
	No	530	26.5
	I don't know	170	8.5
If yes, what is the relation?	Parent	767	37.7
	Sibling	560	27.5
	Sons / Daughters	188	9.2
	Spouse	136	6.7
	Relatives	383	18.8
If yes, what?	Myopia	781	30.9
	Cataract	315	12.5
	Glaucoma	206	8.2
	Amblyopia	181	7.2
	Strabismus	146	5.8
	Hyperopia	428	16.9
	Dry eyes	289	11.4
	Others	95	3.7
	I don't remember eye disease	88	3.5

Figure 1: Study participants awareness about their eye problems



The survey of 2001 participants revealed that 1301 respondents (65.0%) had a family member with an eye problem, 530 (26.5%) knew that no one in their family had an eye problem, and 170 (8.5%) were not sure if any of their family members/relatives had an eye problem (Table 2). Of the 1301 participants who were aware of their family history of eye problems, 781 (30.9%) reported myopia, 315 (12.5%) hyperopia, 206 (8.2%) glaucoma, 181 (7.2%) amblyopia, 146 (5.8%) strabismus, 428 (16.9%) of hyperopia, 289 (11.4%) of dry eyes, 95 (3.7%) of other eye diseases, and 88 (3.5%) said they could not remember the type of eye disease their family member had (Figure 2).

Figure 2: Awareness of study participants about eye problems in their family members



3) Knowledge about Amblyopia

We asked 13 questions (sections II and III) to evaluate the general public's knowledge and attitude about amblyopia. The questions were either multiple choice or yes, no, I don't know.We included two questions related to the meaning of the word "Amblyopia", four questions were related to the causes of amblyopia, two questions about the complications and effects of untreated amblyopia, three questions were about the treatment, and two questions were related to the prevention of amblyopia. The correct answers earned three points, while the incorrect answers earned one point. A "don't know" answer received two points. Eventually, the overall score ranged from 13 to 39. Individuals scoring below 26 were deemed to have very poor knowledge and attitude towards amblyopia, and those scoring 26 to 29 had poor knowledge and attitude towards amblyopia. A score of 30 to 34, and above 34, indicated as good and excellent knowledge and attitude towards amblyopia, respectively.

Forty-eight (2.4%) participants had scored excellent level of knowledge, 680 (33.9%) were shown to have good knowledge whereas 1107 (55.3%) and 166 (8.3%) showed poor and very poor knowledge, respectively regarding definition, causes, treatment and prevention of amblyopia. Variation of knowledge level about amblyopia by education, region, occupation and marital status was statistically significant ($p< 0.05$). The participants' backgrounds were investigated for their relationship with their awareness of amblyopia. There was a significant difference between men and women in awareness of amblyopia, with more women than men knowing about amblyopia ($p=0.02$). Marital status was also found to be associated with awareness of amblyopia ($p = 0.02$), with married respondents more aware of the term amblyopia than those with other marital statuses, including divorced and widowed respondents. Participants' occupation was found to be related to knowledge of amblyopia ($p < 0.001$), with healthcare occupations carrying more knowledge compared to education occupations and housewives/unemployed.Finally, participants with higher (college) education were found to have higher knowledge of amblyopia compared with participants with semiliterate, primary, secondary, and preparatory education ($p < 0.001$) (Table 3).

Table 3:- Association of demographic characters with the knowledge level of amblyopia .

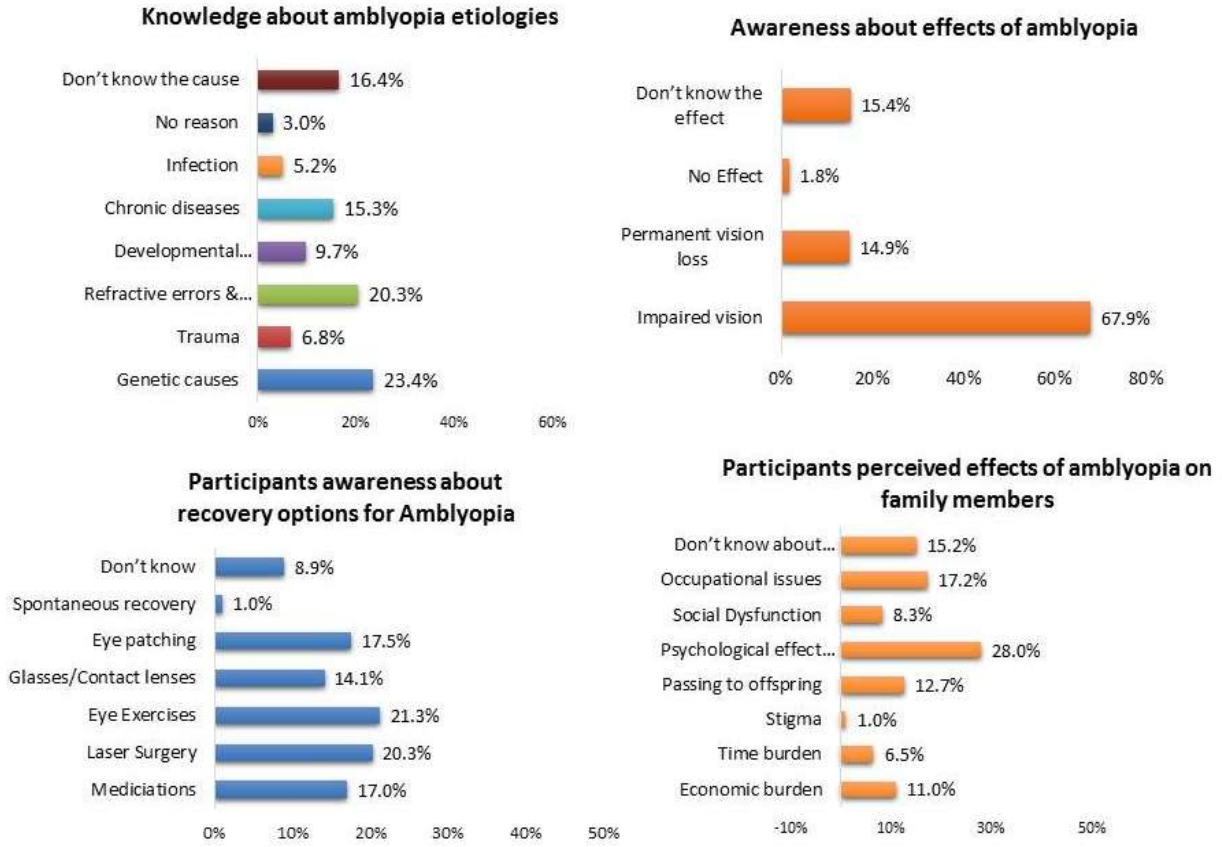
Variable		**Excellent**		**Good**		**Poor**		**Very poor**		Validation
		N	%	N	%	N	%	N	%	
Total		**48**	**2.4**	**680**	**33.9**	**1,107**	**55.3**	**166**	**8.3**	
Gender	Male	10	2.0	161	32.5	260	52.6	63	12.8	$\chi2 = 5$
	Female	38	2.5	519	34.4	847	56.2	103	6.8	P =0.02*
Location	Central	11	2.5	140	31.9	257	58.7	30	6.8	$\chi2 = 20$
	West	13	1.7	278	36.6	404	53.2	65	8.6	Df = 12
	East	8	2.1	110	29.6	219	58.8	35	9.4	P =0.06
	North	12	3.5	119	35.1	175	51.6	33	9.7	
	South	4	4.3	33	35.9	52	56.5	3	3.3	
Education	Semiliterate	1	4.3	6	26.1	11	47.8	5	21.7	$\chi2 = 45$
	Primary	0	0.0	4	28.6	4	28.6	6	42.9	Df = 15
	Preparatory	2	3.8	14	26.4	33	62.3	4	7.5	P <0.001*
	Secondary	8	2.4	82	24.6	215	64.6	28	8.4	
	College	35	2.4	521	36.2	769	53.4	114	7.9	
	Post-graduate	2	1.4	53	38.1	75	54.0	9	6.5	
Occupation	Health	2	1.3	73	48.0	66	43.4	11	7.2	$\chi2 = 63$
	Army	0	0.0	17	23.0	45	60.8	12	16.2	Df = 15
	Education	9	2.2	168	40.6	212	51.2	25	6.0	P <0.001*
	Other	0	0.0	31	17.6	95	17.6	27	17.6	
	Unemployed/ homemakers	37	2.9	391	32.5	689	56.2	91	8.4	
Marital status	Single	27	2.9	307	34.1	491	54.5	76	8.4	$\chi2 = 20$
	Married	21	2.1	334	32.8	577	56.7	85	8.3	Df = 9
	Divorced	0	0.0	29	52.7	21	38.2	5	9.1	P =0.01*
	Widowed	0	0.0	10	35.7	18	64.3	0	0.0	
Age	Mean	29.1		31.2		32.0		32.5		P = 0.16
	SDV	10.2		11.5		12.2		12.3		

N=Number of participants, %- percentage of participants, * p value was statistically significant.

The knowledge about the etiologies, treatment options, and effect of amblyopia on family members is presented in Figure 4. Seven hundred eighty-two (23.6%) people reported that a genetic factor might be an etiology of amblyopia, followed by 663 (20.0%) people who reported refractive errors or strabismus and 554 (16.7%) who reported they don't know.

Regarding the effects of amblyopia, 1359 (67.9 %) reported impaired vision, 298 (14.9%) reported amblyopia leads to permanent vision loss and 308 (15.4%) were not aware of any, and 36 (1.8%) said there was no effect of amblyopia if its untreated. Four hundred twenty-six (21.3%) reported eye exercises, 406 (20.3%) reported laser surgery and 350 (17.5%) reported eye patches as an amblyopia treatment options. Occupational issues and psychological effect on the patient were reported by 344 (17.2%) and 561 (28.0%) participants, respectively as an effect of amblyopia perceived by family members (Figure 3).

Figure 3: Knowledge about amblyopia etiologies, effects and recovery options and effects of amblyopia on family members



The awareness and attitude about amblyopia causes and its treatment outcomes were shown in Table 4. More than 50% of the respondents were reported that they were not aware of squint, uncorrected refractive errors, congenital cataract and ptosis are the causes of amblyopia, whereas 146 (7.3%) were aware that squint, 750 (37.6%) reported uncorrected refractive errors, 482 (24.1%) perceived congenital cataract and 604 (30.2%) responded that ptosis as the amblyopia etiologies.

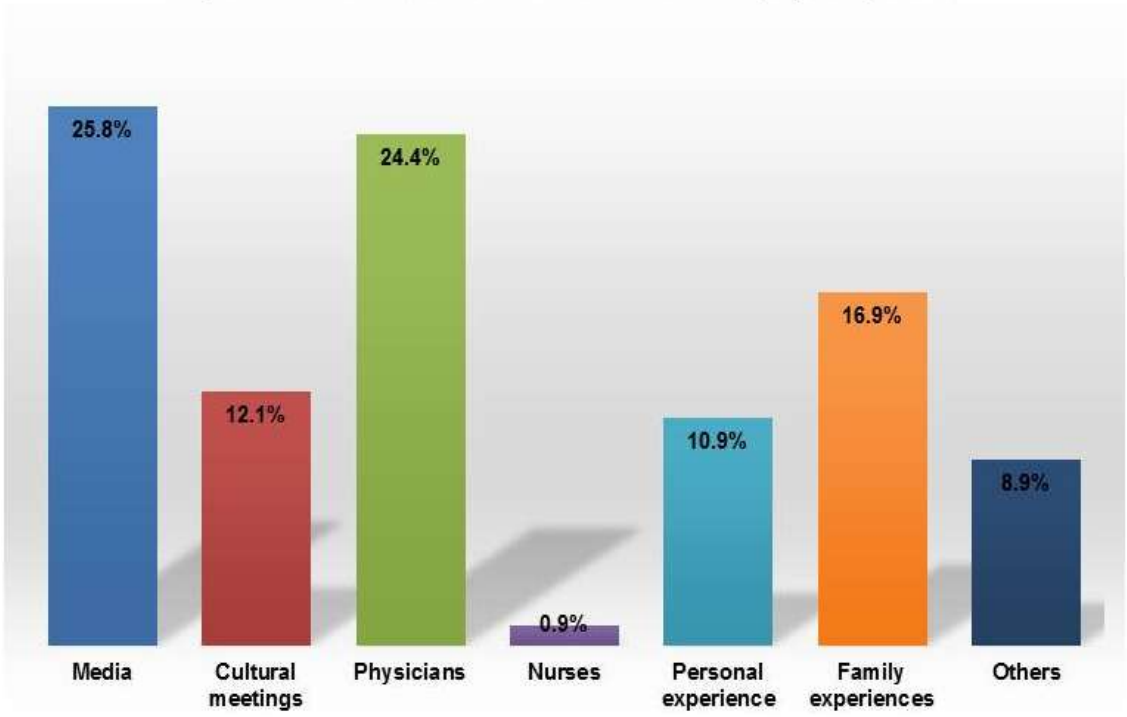
Table 4:- Attitude and perception about amblyopia etiologies and treatment outcomes.

Perception about causes and age of treatment	**Yes N (%)**	**No N (%)**	**Don't know N (%)**
Squint causes amblyopia	146 (7.3)	768 (38.4)	1087 (54.3)
Uncorrected refractive errors cause amblyopia	750 (37.6)	202	1049(52.4)

		(10.1)	
Congenital cataracts cause amblyopia	482 (24.1)	152(7.6)	1367 (68.3)
Congenital cataracts can affect children vision	700 (35.0)	164 (8.2)	1137 (56.8)
Ptosis causes amblyopia	604 (30.2)	218 (10.9)	1179 (58.9)
Wearing glasses without medical prescription affects child's visual development	1701 (85.0)	94 (4.7)	206 (10.3)
Treatment of squint start at the age of 3-5 years	808 (40.4)	208 (10.4)	985 (49.2)
Amblyopia can be treated after age of 18 years	458 (22.9)	356 (17.8)	1187 (59.3)

Regarding the source of knowledge about amblyopia, 531(26.5%) respondents reported that they obtained information about amblyopia from social media/internet (25.8%), physicians (24.4%), family and relatives (17.4%), cultural events (12.1%), personal experiences (10.9%), family experiences (16.9%), nurses (0.9%), and books/studies/others (8.9%), whereas 1470 (73.5%) knew no information about amblyopia (Figure 4).

Figure 4: Sources of information about amblyopia to public



Discussion:-

This cross-sectional study has evaluated the baseline information on the knowledge, attitude, and practice of Saudi community towards amblyopia. The important finding of our study was that awareness about amblyopia among the Saudis was poor. More than 70% of the population were unaware that amblyopia was more prominent in children. Similarly, Al-Saqr et al (2019) showed that 70% of the participants who were parents had no knowledge of amblyopia and 19% have no idea if their children had amblyopia in KSA[18].

Several studies have investigated the public awareness level of common eye disorders, strabismus and amblyopia, worldwide[18-22].Results of our study indicated that 26.1% of the general public were aware of amblyopia, while the amount of awareness was higher among parents who attended pediatrics and ophthalmology clinics, i.e., 49.7% in Jeddah[19] and 36.3% in Riyadh[20]. Our study and studies conducted in other parts of KSA suggest that parents attending pediatric and ophthalmology clinics in KSA are better informed about amblyopia, but public awareness of

amblyopia in KSA is inadequate. This inadequate public knowledge about amblyopia may lead to delays in recognizing the disease and seeking recommended eye care in a timely manner.
In our study, uncorrected refractive errors, congenital cataract, and ptosis were recognized as amblyopia causes among 37.6%, 24.1% and 30.2% of the respondents, respectively. Furthermore, Alhaddab (2019) found that refractive errors and cataracts were perceived to be the cause of amblyopia in Riyadh, Saudi Arabia[20].The most common complications of amblyopia perceived by our survey respondents were vision impairment (67.2%), psychological effects (30.6%), occupational problems (16.6%) and permanent vision loss (14.5%). However, studies have shown reduction in visual acuity, disability, social stigma, double vision, impaired patients' quality of life due to vision loss are the most identified complications of untreated amblyopia[18,20].

Media (25.8%), physicians (24.9%) and family experiences with eye disorders(16.9%) were the reported sources of information about amblyopia. Correspondingly, Abogunrin et al., (2013) showed that internet and social media played a vital role in increasing the awareness about ophthalmological and other diseases[21]. Additionally, they showed that the patients who received information about their disease from social media had better clinical outcomes[21].Our survey showed that physicians are the second most important source of information about amblyopia to the public. Cultural events and personal experiences with eye diseases were also cited as sources of knowledge about amblyopia[18]. However, Singh et al., (2017) showed that relatives and friends represent the main source of knowledge about strabismus and other ocular diseases[22].

Almost 24% of the respondents considered hereditary causes as the most important cause of amblyopia, 20% mentioned refractive errors and strabismus, and 16.7% did not know what causes amblyopia. In addition, > 20% answered that laser surgery and eye exercises are the available treatment options for amblyopia, while 17.2% and 14.9% correctly stated that eye patching and glasses/contact lenses are the treatment options for amblyopia, respectively.The majority of participants in our study was unaware of the causes, effects, and treatment of amblyopia and had many misconceptions, which may negatively impact early detection and treatment.

Conclusion:-

Our study revealed that there is a lack of knowledge among the general public about amblyopia, its causes, the importance of early detection and treatment options. If visual impairment goes unnoticed during the crucial stages of a child's visual development, it can negatively impact the child's eye health, development, and learning performance. Efficient efforts such as public campaigns in shopping malls, hospitals, and schools, media advertisements, eye health videos, promotions, and announcements about amblyopia need to be made to reach a wider audience and improve awareness about amblyopia. Screening for amblyopia in children and addressing amblyogenic risk factors are therefore key to preventing vision loss.

Recommendations:-

Children younger than seven years of age benefit most from treatment, but older children may also benefit. Amblyopia recurs in 25% of children, so continuous monitoring is mandatory. Our findings will help eye care professionals plan programs to educate the public about amblyopia. These educational programs should be integrated into school vision screening programs and public health education programs and disseminated through infotainment programs in the media to educate the public about amblyopia, which will lead to better behavior in seeking ophthalmic care in the community.

Limitations:

There are some limitations to this study: in many cases, the data are based on respondents' memory, could misinterpret some questions, and are therefore subjective. Lack of internet access and illiteracy are some factors that could affect our results since this is a web-based survey. Since this was a self-completed questionnaire, the responses could not be further investigated with follow-up questions like an interview.

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Nil.

Conflicts of interest:
There are no conflicts of interest.

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