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A Study Regarding the Basic Anatomy and Physiology of the Eye among Nursing Students: A Cross-Sectional Study

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Abstract. Objective: to determine the correlation between students' demographic information (age, sex, and stage) and their knowledge of the anatomy and physiology of the eye. Methods: A cross-sectional study was conducted at the College of Nursing at the Bab Al-Zubair Campus in Al-Basrah City. Nursing students are a sample of the study (100), and purposive (non-probability) sampling. The period of the study extended from the 12th of May 2024 to the 10th of February 2025. The questionnaire was constructed by the researchers on reliability (Cronbach's alpha) for 32 items (0.81) and validity of the questionnaire by 13 experts in the field. Results: The findings of these results indicate that most students (60%) have moderate knowledge about the anatomy and physiology of the eye, and (40%) have good knowledge. Conclusion: The results of the study show that most students only have a moderate knowledge of the anatomy and physiology of the eye

Highlights:

1. Assess link between demographics and eye anatomy knowledge.
2. Cross-sectional study using questionnaire with 100 nursing students.
3. Most students had moderate understanding of eye anatomy..

Keywords: Nursing, Students, Anatomy, Physiology, Eye

Introduction

One of the human body's most intricate organs is the eye. The ocular layers that surround the human eye are known as the lens, vitreous, and aqueous layers (1). The cornea is located in front of the pupil and iris, making it the most anterior component of the eye (2). The ophthalmic branch of the trigeminal nerve supplies the majority of the sensory nerves in the cornea, making it the most densely innervated tissue in the body (3-7). The typical horizontal and vertical diameter of the cornea of an adult human eye is 11.5 mm, and its curvature remains largely constant throughout life (8). With a diameter of 4 mm, the optic zone—also referred to as the pre-pupillary cornea—is situated in the middle of the cornea, in front of the pupil. It provides most of the cornea's

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refractive function under photopic conditions. Since the cornea is avascular, the anterior ciliary arteries' branches terminate at the limbus, where they create arcades that provide blood to the cornea's periphery (9).

Bowman's membrane, the endothelium, Descemet's membrane, the lamellar stroma, and the epithelium make up the five layers that make up the human cornea (10). The tear film covers the surface of the corneal epithelium, smoothing out micro-irregularities and shielding the corneal surface from contamination by microorganisms' chemicals, toxins, or foreign bodies (11-12). The tissue on the inside of the eye that surrounds the vitreous chamber is called the retina. The spinal retina arises from the optic cup during development (13). The latter is created by the forebrain's embryonic protrusion known as the invaginating optical vesicle (14-17). The outer wall of the optic cup, which is encircled by the choroid and sclera, develops into the retinal pigment epithelium (RPE), while the inner wall, which encloses the vitreous cavity, eventually becomes the neural retina (18,19).

The six primary neuronal types that comprise the neural retina include photoreceptors, bipolar cells, horizontal cells, amacrine cells, and ganglion cells. The Müllerian glia form the structural core of the neural retina. There are multiple parallel layers of neuronal retinal cells (18-20). Near the nuclei, which are located adjacent to the RPE, are the outer segments of the photoreceptor cells, which are located in the outer nuclear layer. The inner nuclear layer of the retina contains the nuclei of bipolar, amacrine, Müllerian glia, and horizontal cells (21-23). Plexiform layers encircle the inner nuclear layer. While ganglion cells in the inner plexiform layer create synapses with bipolar and amacrine cells, photoreceptors in the outer plexiform layer interact with bipolar and horizontal cells (24-26). The ganglion layer contains the ganglion cells' nucleus, while the nerve fiber layer contains their axons (18). The retina is covered in Müllerian glia processes. The outer limiting membrane is formed by the apical processes forming junctional complexes with photoreceptors and each other. The inner limiting membrane is made up of the vitreal processes' apposed end-feet (27). The Müllerian glia's lateral processes make contact with blood vessels and neurons, forming synapses with axons in the nerve fiber layer and dendrites in the plexiform layers (28-30).

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Methods

At the Bab Al-Zubair Campus of the College of Nursing in Al-Basrah City, a cross-sectional study was carried out. One hundred nursing students make up the study's sample, and purposive (non-probability) sampling was used. The study's time frame was extended from May 12, 2024, to February 10, 2025. The researchers built the questionnaire based on 13 subject-matter experts' assessments of its validity and reliability (Cronbach's alpha) for 32 items (0.81). There are three sections to this questionnaire. Demographic information (age, sex, and stage) makes up the first section. The second part includes 16 items regarding the anatomy of the eye. The third part includes 16 items regarding the physiology of the eye. The researchers use a three- point Likert scale, for each item, yes (3), don't know (2), and no (1) except 8 items (4, 8, 12, 16, 20, 24, 28, and 32) which are form, yes (1), don't know (2), and no (3). The data was analyzed by using SPSS version 26 by using the frequency, percent, mean of a score, and standard deviation. The association between the students' demographic information (age, sex, and stage) and their knowledge was determined using the chi- square test.

Results and Discussion

Table (1): Demographic Characteristics of the Nursing Students N=100

Demographic Data			
Variables	**Classes**	**Frequency**	**Percent**
Sex	**Male**	**13**	**13.0**
	Female	**87**	**87.0**
	Total	**100**	**100.0**
Age (Years) MS±SD = 22.18 ± 3.183	**20-29**	**97**	**97.0**
	30-39	**3**	**3.0**
	Total	**100**	**100.0**
Stage	**Third**	**48**	**48.0**
	Fourth	**52**	**52.0**

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Total	**100**	**100.0**

This table shows the sociodemographic information of the study's participants. Most of the sample were female (87%), and the age group was between 20 and 29 years old (97%). Regarding the stage, more than half of the students were from the fourth stage (52%).

Table (2): Students' Knowledge Regarding the Basic Anatomy of the Eye

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Items	Answer	N = 150		Mean Score	Sd	Assessment
		F	%			
1. The eye globe is spherical and located within the bony orbit	No	9	9.0	2.62	0.648	Good
	Don't Know	20	20.0			
	Yes	71	71.0			
	Total	100	100.0			
2. The orbit's front opening is larger than its rear opening, which narrows.	No	8	8.0	2.57	0.640	Good
	Don't Know	27	27.0			
	Yes	65	65.0			
	Total	100	100.0			
3. The sclera primarily forms and protects the globe itself.	No	4	4.0	2.66	0.555	Good
	Don't Know	26	26.0			
	Yes	70	70.0			
	Total	100	100.0			
4. The sclera is a thin, transparent white tissue	Yes	66	66.0	1.58	0.855	Poor
	Don't Know	10	10.0			
	No	24	24.0			
	Total	100	100.0			
5. The colored portion of the eye that encircles the pupil is called the iris.	No	18	18.0	2.46	0.784	Good
	Don't Know	18	18.0			
	Yes	64	64.0			
	Total	100	100.0			
6. The ciliary body is located behind the iris root.	No	9	9.0	2.41	0.653	Good
	Don't Know	41	41.0			
	Yes	50	50.0			
	Total	100	100.0			
7. At the front of the eye is a tiny, transparent dome called the cornea.	No	16	16.0	2.46	0.758	Good
	Don't Know	22	22.0			
	Yes	62	62.0			
	Total	100	100.0			
8. The fluid that fills the eye's posterior chamber is called aqueous humor.	Yes	47	47.0	1.79	0.832	Moderate
	Don't Know	27	27.0			
	No	26	26.0			
	Total	100	100.0			

Students' Knowledge Regarding General Information about the Breast

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9. The lens is a clear part of the eye behind the iris	No	22	22.0	2.39	0.827	Good
	Don't Know	17	17.0			
	Yes	61	61.0			
	Total	100	100.0			
lined by the transparent retina.	No	8	8.0	2.35	0.626	Good
	Don't Know	49	49.0			
		43	43.0			
	Total	100	100.0			
10. The interior of the globe's posterior region is	Yes					
11. The posterior part of the globe is filled with a gel-like substance called the vitreous body.	No	13	13.0	2.18	0.642	Moderate
	Don't Know	56	56.0			
			31.0			
	Yes	31	100.0			
	Total	100				
12. The frontal lobe of the	Yes	30	12	2.07	0.820	Moderate
	Don't Know	33	20			
	No	37	68			
	Total	100	100			
	No	12	12.0	2.56	0.701	Good
	Don't Know	20	20.0			
	Yes	68	68.0			
	Total	100	100.0			
14. Extra-ocular muscles are six in number and attaché to the eye globe	No	9	9.0	2.37	0.646	Good
	Don't Know	45	45.0			
	Yes	46	46.0			
	Total	100	100.0			
15. The extraocular muscles are innervated by the (3rd CN) Oculomotor brain contains the visual cortex.	No	15	15.0	2.18	0.672	Moderate
	Don't Know	52	52.0			
		33	33.0			
	Total	100	100.0			
13. Each eye has two lids with eyelashes						

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	Yes					
nerve						
16. The optic nerve (2nd CN) starts from the lens to the visual cortex	Yes	48	48.0	1.63	0.677	Poor
	Don't Know	41	41.0			
	No	11	11.0			
	Total	100	100.0			

N= Number, % = Percent, Sd=Standard Deviation

Table (3): Students' Knowledge Regarding Physiology of the Eye

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Total 100

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	No	12	12.0	2.41	0.698	Good

Items	Answer	N = 150		Mean Score	Sd	Assessment
		F	%			
17. The two orbits protect the human eyes	No	7	7.0	2.68	0.601	Good
	Don't Know	18	18.0			
	Yes	75	75.0			
	Total	100	100.0			
18. The sclera is the tissue that anchors the extraocular muscles.	No	5	5.0	2.38	0.582	Good
	Don't Know	52	52.0			
	Yes	43	43.0			
	Total	100	100.0			
19. The extra-ocular muscles are responsible for eye globe movement	No	3	3.0	2.58	0.554	Good
	Don't Know	36	36.0			
	Yes	61	61.0			
	Total	100	100.0			
20. The cornea and the posterior part of the globe are protected by the eyelids	Yes	48	48.0	1.76	0.818	Moderate
	Don't Know	28	28.0			
	No	24	24.0			
	Total	100	100.0			
21. The cornea is the primary focusing structure in the eye	No	11	11.0	2.51	0.689	Good
	Don't Know	27	27.0			
	Yes	62	62.0			
	Total	100	100.0			
22. The iris controls how much light enters the eye.	No	16	16.0	2.46	0.758	Good
	Don't Know	22	22.0			
	Yes	62	62.0			
	Total	100	100.0			
23. Focusing on things at varying distances from the eye is made possible by the lens.	No	14	14.0	2.48	0.731	Good
	Don't Know	24	24.0			
	Yes	62	62.0			
	Total	100	100.0			
24. Touch or particles close to the eye do not cause the eyelashes to become sensitive.	Yes	36	36.0	2.02	0.864	Moderate
	Don't Know	26	26.0			
	No	38	38.0			
	Total	100	100.0			
25. Retina is the structure where images are formed	No	11	11.0	2.49	0.689	Good
	Don't Know	29	29.0			
	Yes	60	60.0			
			100.0			

Students' Knowledge Regarding Physiology of the Eye

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26. The glands in charge of preserving the tear layer are found in the lids.	Don't Know	35	35.0			
	Yes	53	53.0			
	Total	100	100.0			
27. The ciliary body regulates the form of the eye's lens.	No	12	12.0	2.27	0.664	Moderate
	Don't Know	49	49.0			
	Yes	39	39.0			
	Total	100	100.0			
28. Aqueous is produced by the iris	Yes	19	19.0	2.04	0.650	Moderate
	Don't Know	58	58.0			
	No	23	23.0			
	Total	100	100.0			
29. The vitreous provides light transmission through the eye and protects the retina.	No	10	10.0	2.33	0.652	Good
	Don't Know	47	47.0			
	Yes	43	43.0			
	Total	100	100.0			
30. The visual cortex is where the vision occurs	No	11	11.0	2.41	0.683	Good
	Don't Know	37	37.0			
	Yes	52	52.0			
	Total	100	100.0			
31. The optic nerve plays a critical role in vision	No	8	8.0	2.55	0.642	Moderate
	Don't Know	29	29.0			
	Yes	63	63.0			
	Total	100	100.0			
32. Aqueous provides nutrients to the retina	Yes	39	39.0	1.77	0.709	Moderate
	Don't Know	45	45.0			
	No	16	16.0			
	Total	100	100.0			

N= Number, % = Percent, Sd=Standard Deviation

Table (4): Students' Knowledge Regarding The Anatomy and Physiology of the Eye for All Domains

Students' Knowledge						
Assessment levels	**F**	**Percent**	**Scale**	**Total**		
				MS	**Sd**	**Assessment**
Poor	**0**	**0.0**	**1 – 1.66**			
Moderate	**60**	**60.0**	**1.67 – 2.33**	**2.29**	**0.697**	**Moderate**

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Good	**40**	**40.0**	**2.34 – 3**
Total	**100**	**100.0**	

F = frequency, MS = Mean Score, Sd=Standard Deviation.

With a mean score and standard level deviation of 2.29+0.697, the table's findings indicate that 60% of students have a moderate understanding of the anatomy and physiology of the eye, 40% have good knowledge, and none have poor knowledge.

Table (5): Relationships of Demographic Characteristics and Students' Knowledge

Variables	Classes	Knowledge			Significant
		Moderate	Good	Total	
Sex	Male	7	6	13	Chi-Square Test = 0.236 Df = 1 P-Value = 0.627 NS
	Female	53	34	87	
	Total	60	40	100	
Age (Years)	20-29	57	40	97	Fisher's Exact Test = 2.062 Df = 1 P-Value = 0.273 NS
	30-39	3	0	3	
	Total	60	40	100	
Stage (Year)	Third	32	16	48	Chi-Square= 1.709 Df= 1 P-Value= 0.191 NS
	Fourth	28	24	52	
	Total	60	40	100	

Df: Degree of freedom, P: Probability value, NS: Not Significant

With a P-value > 0.05, the results of this table demonstrate that there is no significant correlation between students' age, sex, or stage and their understanding of the anatomy and physiology of the eye.

Discussion

The goals of this study have led to the division of this section into three sections. The first section discusses the demographic information, while the second section discusses the students' understanding of the anatomy and physiology of the eye and the third part is the relationship between the students' knowledge and their demographic data (age, sex, and stage).

Part One: Discussion of the demographic data of the students

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Here are the sociodemographic characteristics of the study's participants. The sample was composed of 87% females. Numerous studies (31-35) have found that women made up the majority of the study sample, which this result confirmed.

Ninety-seven percent of the participants were in the 20–29 age range. The majority of the students were between the ages of 20 and 29, according to multiple research (36–40), which supported this finding.

Regarding the stage, more than half of the students were from the fourth stage (52%). This result agreed with several studies (41-45) which reveals that the fourth stage comprised the majority of the study sample.

Second Part: Students' Knowledge Regarding the Anatomy and Physiology of the Eye

Most students know only a little bit about the anatomy and physiology of the eye.

The results of this investigation aligned with a study (46) that discovered that most of the study participants had only a moderate understanding of the anatomy and physiology of the eye.

The researcher's opinion according to the results of this study, students have moderate knowledge about the anatomy and physiology of the eye due to the eye being included in the curriculum for the College of Nursing, and students develop and update their knowledge.

Third Part: Relationship of Students' Knowledge and their Demographic Characteristics

The results of this study demonstrate that students' knowledge of the anatomy and physiology of the eye is not significantly correlated with their age, sex, or stage.

This result corroborated the study (48), which revealed no relationship between students' age, sex, or stage and their level of knowledge.

Conclusion

This study concludes that most students have moderate knowledge regarding the anatomy and physiology of the eye. Students' knowledge of the anatomy and physiology of the eye is not significantly correlated with their age, sex, or stage

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