Why Do Medical Students at Assiut University Use Smartwatches?

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ABSTRACT

The utilization of smartwatches by medical students is prevalent, primarily due to their role in health monitoring, which serves as a significant motivator. These devices provide real-time data, including heart rate, oxygen levels, sleep patterns, and stress levels, which aid in reducing burnout and enhancing overall well-being. Academically, smartwatches offer immediate access to medical references, calculators, and clinical applications during rotations, thereby improving efficiency, effectiveness, and decision-making. This study aimed to analyze the usage patterns and assess the causes and effectiveness of smartwatch use among preclinical medical students at Assiut University. An analytical cross-sectional study was conducted with a calculated sample size of 420. During the 2024-2025 academic year, medical students participated by completing a self-administered semi-structured questionnaire. This questionnaire was developed using Google Forms and disseminated to medical students via Telegram channels. Data analysis was performed using SPSS version 26.0. Among the 613 medical students included in this study, 126 (20.6%) reported using smartwatches. The average age of these users was 19.10 ± 1.04 years. A statistically significant higher prevalence of smartwatch ownership was observed among younger and urban students compared to their older and rural counterparts. Approximately 46.8% of users wore the smartwatch continuously, while 48.4% wore it daily. Except for the perception of improved overall health and fitness, no statistically significant differences were found between smartwatch users regarding the frequency of use and perceptions of health and fitness. Participants generally exhibited a positive attitude towards the impact of smartwatches on their health and fitness.

1. INTRODUCTION

Artificial intelligence (AI) refers to the ability of computers or computer-controlled systems to perform activities that require cognitive functions similar to those found in the human brain. Its use in medicine and healthcare is constantly increasing [1].

A smartwatch (SW) is a tiny computing device that connects to other devices via short-range wireless technologies such as Bluetooth. It generates notifications, collects and stores personal information via various sensors, and works as a clock [2]. Smartwatches have proven useful in a variety of healthcare applications, with health and fitness tracking being the most popular [3,4]; [5,6].

These gadgets combine tiny biosensors and modern processing technologies to provide consumers with a simple and non-invasive way to monitor physiological data. They can automatically send this data to other smart devices, such as smartphones and tablets. Smartwatches, unlike smartphones and other electronics, are designed to integrate seamlessly into daily life [3]. Users can monitor their fitness and health at any time and from any location, as well as receive medical information to help them manage health concerns [7, 8]. However, their reliability in the healthcare arena is frequently questioned because of confusing algorithms and unpredictable outcomes in clinical condition diagnosis [9]. Many smartwatches have advanced features, such as heart rate monitors that use specialized sensors and laser technology to detect changes in blood volume at the wrist [10 , 11].

When an epilepsy sufferer wears a smartwatch with an AI algorithm capable of recognizing high-risk seizures and alerting others for help, this technology can be extremely helpful. Prompt responses to seizures can dramatically lower the risk of serious damage or death because the smartwatch continuously monitors vital signs and sends essential signals [12]. However, most smartwatches prioritize convenience over medical assessment, safety concerns must be addressed. This is because smartwatches collect enormous amounts of sensitive health data, which creates privacy and security concerns. Unauthorized access to this data could threaten user privacy and lead to the misuse or exploitation of personal information. Strong encryption, strict access controls, and explicit privacy policies are required to protect user data [13]. Manufacturers should prioritize end-to-end encryption for sensitive health data to prevent illegal access [14].

1.1. Research Questions

Assiut University preclinical medical students: What's the reason behind their smartwatch usage? Can these devices be trusted for clinical measurements, and what features contribute to their reliability?

1.2. Aims of the Study

This study aimed to investigate how preclinical medical students at Assiut University utilize smartwatches, understand the motivations behind their use, and evaluate the effectiveness of these devices.

2. MATERIALS and METHODS

2.1. Study Design

An analytical cross-sectional approach was conducted.

2.2. Study Population

The study included a sample of 613 medical students selected from a pool of 3,979 preclinical medical students, which consisted of 2,544 from public university and 1,435 from national one. The main criterion for inclusion was that the participants had to be pre-clinical medical students (in their 1st, 2nd, or 3rd year) at Assiut University for the academic year 2024/ 2025.

2.3. Sample Size

The sample size was calculated using the StatCalc feature in EPI-Info version 5, based on a prevalence rate of 50% [15] and a permissible margin of error (d) of no more than 0.05. This calculation indicated that a total sample size of 350 was necessary. To account for a 20% nonresponse rate, the final sample size was increased to 420 students.

2.4. Study Instrument

The questionnaire was created using Google Forms and distributed to medical student groups on Telegram, along with a cover letter summarizing the study's aims. Data collecting occurred throughout a two-month period, from January to February 2025, during periods when no exams were scheduled. The questionnaire includes questions about sociodemographic information, smartwatch use, and perceived effectiveness.

2.4.1. Demographic Data

The first portion of the survey focuses on the participants' socioeconomic origins. This section investigates how socioeconomic position affects the uptake of AI-enhanced smartwatches in healthcare settings. The demographic information gathered from respondents included gender, age (in years), household size, education level, career, and any relevant health issues.

2.4.2. Usage Trends: Smartwatch Technology and Its Efficacy

Usage trends: refers to the provision of real-time health data. Technology has steadily gained global recognition. Consequently, the second part of the survey examines the usage trends among medical students.

Effectiveness: The rise of smartwatch technology emphasizes the need to migrate from traditional smartwatches to AI-powered gadgets that improve health. It is critical to analyze medical students' attitudes of the effectiveness of smartwatch technology in improving health communication. The final segment investigates the benefits of AI-enabled smartwatches.

Respondents' patterns of usage and effectiveness included inquiries about general smartwatch usage, applications for fitness and health tracking, perceived benefits of smartwatch use, students' experiences with these devices for health monitoring, and the connection between how often students use smartwatches and their perceptions of improvements in health and fitness.

2.5. Pilot Study

A pilot study was carried out with a group of 20 medical students (who were not part of the main study) through personal interviews to complete self-administered questionnaires, with adjustments made to the questions, as necessary.

2.6. Statistical Evaluation

The data analysis was conducted using version 26.0 of the Statistical Package for the Social Sciences (SPSS) for Windows. Quantitative data were reported as means along with their standard

deviations, whereas qualitative data was shown as frequencies and percentages. The Chi-squared test was employed to assess significance ($P < 0.05$). The McNemar test to compare paired proportions.

3. RESULTS

The survey focused on 613 students, among whom 126 were smartwatch users. The study results are divided into three sections:

- Demographic background
- Usage patterns
- Effectiveness

Figure 1 illustrates the proportion of Assiut University medical students using smartwatches in 2025. This study included 613 medical students; 126 of them (20.6%) had smartwatches.
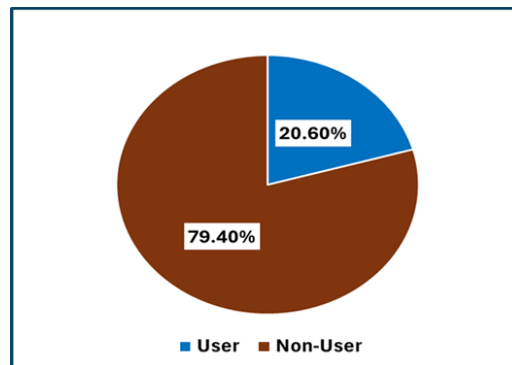

Figure 1. The percentage of the studied medical students at Assiut University using smartwatches, 2025

3.1. Demographic background

As shown in Table 1, the mean age of users was 19.10±1.04 years, and 71.4% of them were under 20 years old. Approximately two-thirds (65.1%) were male, and 67.5% were urban residents. The findings indicated that the vast majority were Egyptian, and more than three-quarters of the students attending the National University. Regarding the educational levels of the students' parents, most fathers and mothers had a university degree or higher (75.4% and 69.0%, respectively). Less than two-thirds of the sample had parents who were professionals, and 8.7% of fathers and 12.7% of mothers were doctors or pharmacists. Almost half of the students' mothers (46.8 %) were housewives.

The age of non-users was 60.8% of them were under 20 years old. Approximately more than half (57.3%) were male, and 56.9%were urban residents. The findings indicated that the vast majority were Egyptian, with more than three-quarters of the students attending the National University. Regarding the educational levels of the students' parents, most fathers and mothers had a university degree or higher (70.2% and 60.4%, respectively). More than half of the sample had parents who were professionals, and 9.4% of fathers and 6.6% of mothers were doctors or pharmacists.

Stay-at-home mothers accounted for nearly half of the student population (48.5%). By comparison between the users and non-users, so, this difference is statistically significant ($P < 0.05$). The owners of the smartwatches were predominantly younger and urban students.

Table 1. The relationship between using smartwatch by the studied students and their sociodemographic characteristics

| Sociodemographic characteristics	Do you have a smartwatch?				P-value
	Yes		No		
	No.	%	No.	%	
Age: (years)					
< 20	90	71.4%	296	60.8%	0.027*
≥ 20	36	28.6%	191	39.2%	
Mean ± SD	19.10±1.04		19.44±1.3		
Sex:					
Male	82	65.1%	279	57.3%	0.113
Female	44	34.9%	208	42.7%	
Nationality:					
Egyptian	122	96.8%	454	93.2%	0.130
Non-Egyptian	4	3.2%	33	6.8%	
Type of the university:					
Public	30	23.8%	129	26.5%	0.541
National	96	76.2%	358	73.5%	
Residence:					
Urban	85	67.5%	277	56.9%	0.031*
Rural	41	32.5%	210	43.1%	
Father education:					
Less than secondary	7	5.6%	38	7.8%	
Secondary education	24	19.0%	107	22.0%	0.481
University or more	95	75.4%	342	70.2%	
Mother education:					
Less than secondary	13	10.3%	82	16.8%	
Secondary education	26	20.6%	111	22.8%	0.124
University or more	87	69.0%	294	60.4%	
Father job:					
Professional	77	61.1%	276	56.7%	
Free business	24	19.0%	107	22.0%	0.837
Skilled worker	14	11.1%	58	11.9%	
Doctor or pharmacist	11	8.7%	46	9.4%	
Mother job:					
Professional	51	40.5%	219	45.0%	
Housewife	59	46.8%	236	48.5%	0.070
Doctor or pharmacist	16	12.7%	32	6.6%	
Number of family members:					
2 – 5	48	38.1%	171	35.1%	
6 – 7	62	49.2%	235	48.3%	0.536
> 7	16	12.7%	81	16.6%	
Suffering from any chronic disease:					
Yes	6	4.8%	46	9.4%	0.093
No	120	95.2%	441	90.6%	
Family history of chronic disease:					
Yes	58	46.0%	191	39.2%	0.165
No	68	54.0%	296	60.8%	

*The chi-square is used. A p-value greater than 0.05 does not indicate statistical significance, but a p-value less than 0.05 does

Table 2. History of chronic diseases among the students using smartwatches and their family

Item	No. (126)	%
Are you suffering from any chronic health problem?		
Yes	6	4.8
No	120	95.2
Type of chronic diseases (n= 6)		
High blood pressure	2	33.3
Diabetes mellitus	1	16.7
Gastrointestinal problems	1	16.7
Dermatological problems	1	16.7
Is a family member suffering from any chronic disease?		
Yes	58	46.0
No	68	54.0
Type of chronic disease: (n= 58)		
Diabetes mellitus	42	72.4
High blood pressure	33	56.9
High blood pressure and Diabetes mellitus	21	36.2
Cardiovascular disease	9	15.5
Immune diseases	1	1.7
Neurological problems	1	1.7

Table (2) shows that six of the studied smartwatch users had chronic medical issues: high blood pressure, diabetes mellitus, gastrointestinal disorders, and dermatological problems. 46.0% of participants had a positive family history of chronic illnesses.

Figure 2 depicts how frequently students using smartwatches visited doctors in the previous 12 months. More than half of the students using the smartwatches reported that they visited doctors for medical issues one to three times in the last year.
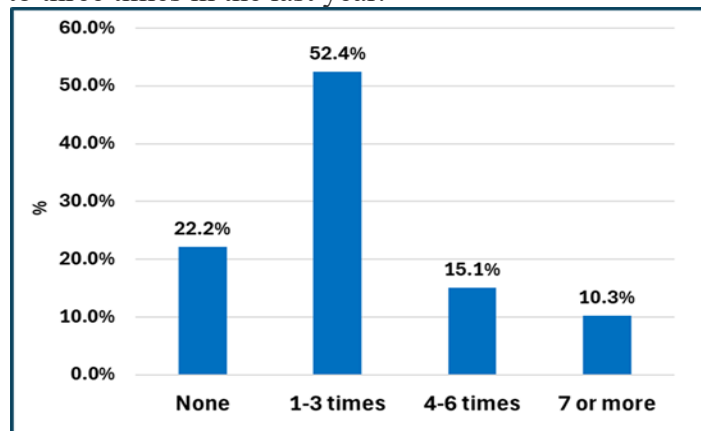
Figure 2. Frequency of doctor visits by students using smartwatches in the last year

3.2. **Usage pattern**: A smartwatch technology and its effectiveness

Table 3. Brands of smartwatch used

Item	No. (126)	%
Type of smartwatch used**?**		
Apple	69	54.8
Samsung	16	12.7
Huawei	27	21.4
Other	14	11.2

When asked about their smartwatch types and brands, it was found that 54.8%) of people use Apple-type, whereas 14 (11.2%) use other-type as shown in Table (3).

When asked about their smartwatch usage, it was found that 46.8% of the users wore their watches everywhere, and 48.4% wore them daily. Regarding smartwatch use, 60.3% of the users reported that they used their smartwatches during study time only, while 11.1% wore them throughout the day. On the other hand, 32.5% used them throughout the weekends.

It was found that 45.2% of users use a smartwatch regularly because of their functionality and health tracking, respectively. 84.1% of users have the highest frequency of doing daily health checking, as shown in Table (4).

Table 4. General information about using smartwatches by the studied students

Item	No. (126)	%
How long have you owned your smartwatch?		
Less than 6 months	34	27.0
6-12 months	28	22.2
1-2 years	32	25.4
More than 2 years	32	25.4
Where do you usually wear your smartwatch?		
Everywhere	59	46.8
Work	50	39.7
Gym	21	16.7
Running	18	14.3
How often do you wear your smartwatch?		
Daily	61	48.4
Weekly	27	21.4
Rarely	38	30.2
Daily usage:		
During study time only	76	60.3
Irregular time	22	17.5
Always	14	11.1
Night time only	14	11.1
Use smartwatch on weekends:		
Yes	41	32.5
No	40	31.7
Sometimes	45	35.7
What motivates you to use your smartwatch regularly?		
Functionality	57	45.2
Health tracking	57	45.2
Notifications	50	39.7
Style	42	33.3
How often do you check your smartwatch for health-related updates:		
Rarely	64	50.8
Once a day	19	15.1
Multiple times a day	22	17.5
Multiple times a week	21	16.7
Frequency of daily health checking on smartwatch by you:		
10 times and below	106	84.1
11 to 15 times	14	11.1
16 to 19 times	3	2.4
20 times or more	3	2.4

Table 5. Using smartwatches for fitness and health monitoring by the studied students

Item	No. (126)	%
Types of available health data in your smartwatch?		
Fitness	82	65.1
Pulse	82	65.1
Blood pressure	68	54.0
Workout monitoring	67	53.2
Health tracking	62	49.2
Sleep monitoring	43	34.1
Which feature is a priority for you when choosing a smartwatch for health?		
Battery life	77	61.1
Accuracy	74	58.7
Design	56	44.4
Price	48	38.1
Compatibility with applications	43	34.1
Reasons for using smartwatch for health and fitness?		
Using smartwatch for health monitoring is fun.	120	95.2
It is likely that I will suffer from chronic disease.	6	4.8
I am at risk of suffering from the chronic disease.	7	5.6
I am suffering from chronic disease.	4	3.2
Do you use guided workout programs on your smartwatch?		
Yes	38	30.2
No	78	61.9
Not applied	10	7.9
Which activities do you track using your smartwatch?		
Running	99	78.6
Strength training	48	38.1
Cycling	18	14.3
Swimming	17	13.5
Yoga	8	6.3
Do you use your smartwatch to track your water intake?		
Yes	15	11.9
No	76	60.3
Sometimes	24	19.0
Not applicable	11	8.7
Do you track your sleep with your smartwatch?		
Yes	17	13.5
No	86	68.3
Sometimes	21	16.7
Not applied	2	1.6
Do you use smartwatch to measure blood glucose level?		
Yes	7	5.6
No	83	65.9
Sometimes	12	9.5
Not applied	24	19.0

Table (5) demonstrates how the researched students utilize smartwatches to monitor their fitness and health. About two-thirds of the users reported that their smartwatches provide fitness tracking and pulse monitoring. Blood pressure, workout monitoring, health tracking, and sleep monitoring functionalities were reported by 54.0%, 53.2%, 49.2%, and 34.1%, respectively. In term of why people use smartwatches for health and fitness, the first reason, "using a smartwatch for health monitoring is fun," was reported by the vast majority of students (95.2%).
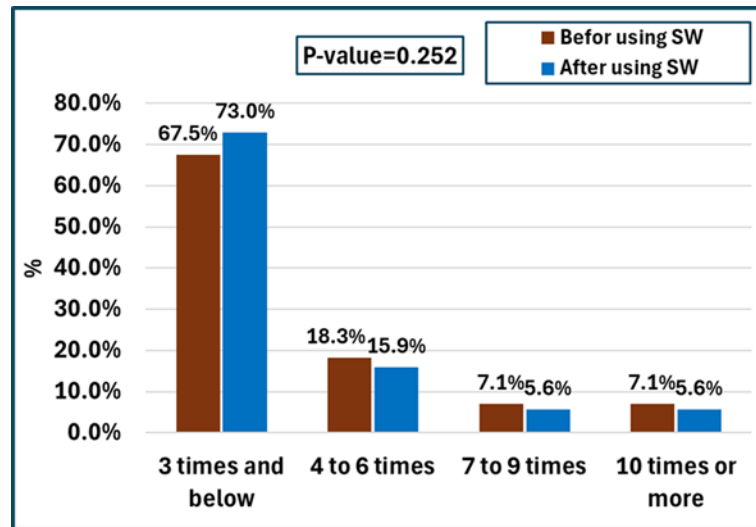
Figure 3. The difference between the frequency of doctor visits before and after smartwatch using

Figure (3) shows the variation in the frequency of medical visits before and after use.

There is no statistically significant difference in the frequency of doctor visits for medical health problems in the year before and after using the smartwatch (P > 0.05) by using McNemar test. However, the frequency decreased after using the smartwatch.

As shown in Table (6), about one quarter of smartwatch users felt that smartwatches have improved their overall health and fitness. Half of the users thought that using a smartwatch may raise awareness of health problems and promote a healthier lifestyle. Personal goals and health reasons were the main motivators for students to stay active with the help of their smartwatches. The influence of smartwatches on users' daily routines included tracking walking distances (62.7%), managing notifications (54.8%), easily tracking workouts (47.6%), and monitoring health more effectively (43.7%). The smartwatch helped medical students improve their overall health by tracking fitness through monitoring eating habits, calorie changes, heart rate, blood pressure, oxygen levels, and tracking sleep.

Table 6. Perceived usefulness of using smartwatches by the studied students

Item	No. (126)	%
Do you feel that your smartwatch has improved your overall health and fitness?		
Yes	34	27.0
No	44	34.9
Not sure	48	38.1
Do you think that using smartwatch may raise awareness for health problems and promote a healthier lifestyle?		
Yes	63	50.0
No	63	50.0
What motivates you to stay active with the help of your smartwatch?		
Personal goals	70	55.6
Health reasons	53	42.1
Competition with friends	24	19.0
Rewards	17	13.5
Do you think that using smartwatch motivate you to live healthier than in the past?		
Yes	38	30.2
No	88	69.8
How has owning a smartwatch changed your daily routine? *		
Track walking distances	79	62.7
Control your notifications	69	54.8
Track your workouts easily	60	47.6
Track health better	55	43.7
Sleep better	48	38.1
Drink water regularly	45	35.7
Remember your medications	41	32.5
Track weight	39	31.0
Have you noticed any improvements in your health since using a smartwatch?		
Yes	27	21.4
No	99	78.6
If yes, how has your smartwatch helped you improve your overall health? * (n= 27)		
Track fitness by monitoring eating and calorie changes	25	92.6
Check heart rate and oxygen	17	63.0
Check blood pressure	16	59.3
Track sleep	10	37.0

* More than one answer is allowed

Table7. The experience of the students regarding using smartwatches for fitness and health monitoring

Item	No. (126)	%
What specific health metric do you wish your smartwatch could track?		
Heart rate	71	56.3
Respiratory rate	48	38.1
Sleep	45	35.7
Cardiac rhythm	37	29.4
Would you consider upgrading to a smartwatch with blood oxygen monitoring?		
Yes	75	59.5
No	28	22.2
May be	23	18.3
How important are sleep tracking features on a smartwatch to you?		
Not important	53	42.1
Somewhat important	59	46.8
Very important	14	11.1
Is blood glucose measurement of smartwatch accurate?		
Yes	7	5.6
No	55	43.7
Sometimes	30	23.8
Not applied	34	27.0
How accurate do you find the heart rate monitoring on your smartwatch?		
Not accurate	18	14.3
Somewhat accurate	98	77.8
Very accurate	10	7.9
Would you be interested in a smartwatch with ECG capabilities?		
Yes	84	66.7
No	20	15.9
Not sure	22	17.5
Smartwatches may be a substitute for a doctor's visit?		
Yes	6	4.8
No	107	84.9
Not sure	13	10.3
Do you share your health data from your smartwatch with a healthcare professional?		
Yes	16	12.7
No	100	79.4
Not applied	10	7.9
Do you have any concerns regarding the privacy of your health data on your smartwatch?		
Yes	23	18.3
No	94	74.6
Not applied	9	7.1
Would you recommend a smartwatch to a friend/ family for health and fitness tracking?		
Yes	54	42.9
No	12	9.5
May be	60	47.6

ECG: Electrocardiogram is a device used as a quick test to check the heartbeat

Table (7) presents users' experiences with smartwatches in relation to their health. Facilitating conditions improve people's desire to utilize smartwatches for fitness and health monitoring. Respondents chose smartwatches' heart rate capabilities, followed by ECG capacity (66.7%), blood oxygen monitoring (59.5%), and sleep monitor (57.9%).
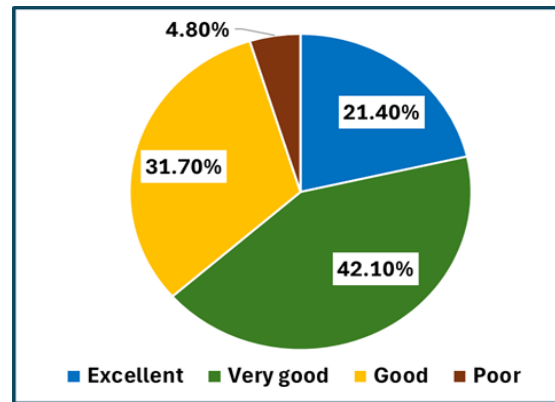
Figure 4. The perceived confidence of studied students with smartwatch use

As shown in Figure (4), students were confident after utilizing a smartwatch for study purposes. illustrates that the level of confidence and the experience of smartwatch users were high. Excellent, very good, and good were indicated by 21.4%, 42.1%, and 31.7%.

Table 8. The relationship between the frequency of wearing smartwatch and the students' perception of health and fitness improvement

	How often do you wear your smart watch?						P-value
	Daily (n= 61)		Weekly (n= 27)		Rarely (n= 38)		
	No.	%	No.	%	No.	%	
Do you feel that your smartwatch has improved your overall health and fitness?							
Yes	20	32.8	10	37.0	4	10.5	0.022*
No	41	67.2	17	63.0	34	89.5	
Do you think that using smartwatch may raise awareness for health problems and promote a healthier lifestyle?							
Yes	31	50.8	12	44.4	20	52.6	0.797
No	30	49.2	15	55.6	18	47.4	
Do you think that using smartwatch motivate you to live healthier than in the past?							
Yes	17	27.9	12	44.4	9	23.7	0.177
No	44	72.1	15	55.6	29	76.3	
Have you noticed any improvements in your health since using a smartwatch?							
Yes	16	26.2	6	22.2	5	13.2	0.303
No	45	73.8	21	77.8	33	86.8	

*The chi-square is used. A p-value greater than 0.05 does not indicate statistical significance, but a p-value less than 0.05 does

Table (8) shows that the daily wearing of smartwatches can enhance fitness and overall health among 32.8% of students compared to 10.5% of those who rarely wear them. ($p < 0.05$) A statistically significant difference is present.

4. DISCUSSION

To understand AI's role in health communication, researchers used smartwatches in their study. The aim is to investigate the role of artificial intelligence in health communication, particularly smartwatches, and evaluate its influence on improving monitoring and care delivery.

Health consciousness tends to be greater among medical students than in other groups [16]. Several studies have demonstrated the usage of smartwatches for activity tracking, including applications in medical diagnosis, fitness training, healthy lifestyle, entertainment, and education [17]; [18]. The current study revealed that the prevalence of using smartwatches among medical students at Assiut University was 20.6%, which is nearly less than half of a study of a Delhi resident study [19] showed that 46.6% learned about AI's role in health communication via smartwatches.

Data analysis revealed that:

There is a statistically significant difference regarding age distribution among responders, with younger medical students under 20 using smartwatches more than older individuals. Pandey and his team in 2022 found that people aged 19 to 30 utilize smartwatch technology for health warnings [19].

There is a statistically significant proportion of urban respondents used the smartwatches. According to Hale and others in 2010, rural people are less likely to have technological components. The Apple watch is more use among people [20]. The Apple Watch is effective at identifying heart arrhythmias such as atrial fibrillation utilizing photo plethysmography and ECG recording [21].

Sex difference did not significantly affect the responses. Despite this, a larger percentage of men than women use smartwatches. Pandey and his colleagues when they looked at the gender of users, they found that both males and females use AI-based health-tracking systems [19].

A proportion of medical students had chronic medical difficulties and a family history of chronic diseases, so they prefer using smartwatches. According to Beh and others in 2021, smartwatches can be identified by measuring physiological variables such as body temperature, arterial blood pressure, and heart rate; deviations from the normal range can be concerning [22]. For example, heart rate can predict cardiovascular fitness, and daily movement data can provide insight into a user's level of physical activity. These two measurements have a substantial correlation with cardiovascular and metabolic illnesses (CVMDs) [5]. Hemoglobin oxygen saturation, is a key physiological parameter for identifying chronic pulmonary disease (COPD) and sleep apnea [23]; [24]. Although changes in these physiological features cannot be used to diagnose disease or illness, the data can help users detect early warning symptoms. Smartwatches can help users enhance their health and fitness while also alleviating their anxieties.

Some of medical students used smartwatches for fitness and health overall, which includes fitness, workout monitoring, pulse, blood pressure, health tracking, self-reported measurements, water tracking, heart rate, respiration rate, cardiac rhythm, sleep tracking and blood oxygen levels. Sumathy and his colleagues in 2020 reported that medical students may misidentify their symptoms with the ailment under study [25]. For example, if the student is studying brain cancers, they may feel that their headaches are symptomatic of a tumor. Worldwide, medical students' symptoms (MSS) are classified into two categories: cognitive and distress, with the first consisting of a student's conviction that he has the condition under study and secondly, worry arises from the

cognitive component. As a result, medical students wear smartwatches to monitor their health or to obtain a higher quality of life   in order to avert fear.

Medical students said that smartwatches influenced their daily health behavior. According to Beh and his colleagues in 2021, health and fitness smartwatches typically track users' calories burned, steps taken, and heart rate, with more current models also analyzing sleep patterns, stress levels, blood pressure, and blood oxygen saturation [22]. So, smartwatches can change daily routines for the better.

The results of the current study explain that there is change in the number of doctor visits for medical health problems in the year before and after using the smartwatch. So, the influence of smartwatches on doctor visit frequency is anticipated to be complex and variable, depending on individual health conditions, smartwatch usage patterns, and the healthcare provider's strategy [26].

Arksey and O'Malley's reported that despite the advantages of using smartwatches for disease diagnosis, it is critical to approach data interpretation with caution [27].

The discrepancies in detection between smartwatches and their algorithms have important i mplications for healthcare use.
The algorithms used must be accurate and dependable, as should the smartwatches' ability to dete ct changes in health status.

There are some limitations of using smartwatches, Individuals may misunderstand data from smartwatches, causing undue anxiety or a delay in obtaining needed medical care [28]. More rigorous clinical trials are required to confirm the use of smartwatches in specific medical situations and demonstrate their utility in improving patient outcomes [29]. Smartwatches can be pricey, potentially limiting their appeal to particular groups and also, subscription fees for specific features and apps can increase the overall cost of wearing a smartwatch [30].

So, this study found that smartwatch is a useful tool for assisting medical students and all people but, there is no substitute for the doctors.

Limitations of the study

Despite being the first study conducted in Egypt on the use of smartwatches by medical students, the study had some limitations that should be considered in the future. The study's generalizability may be limited because it involved medical students in the preclinical stage at Assiut University. The study did not include other medical students because it went beyond its scope. Time and cost constraints limit the researchers' ability to collect data through direct face-to-face interviews. The current study used a cross-sectional design with a survey questionnaire to collect data over a short period; however, a longitudinal research design would have allowed extended supervision to reveal the long-term health effects of smartwatch use.

Participants' information for the study was gathered via a Google Forms survey. The current study only looked at the medical field; therefore, future research should focus on both academic and non-academic areas.

5. CONCLUSION

At Assiut University, one-fifth of preclinical medical students reported wearing smartwatches. These devices have the potential to encourage students to adopt healthier lifestyles while alleviating anxiety and enhancing overall well-being. About half of the smartwatch users felt that

these devices helped increase their awareness of health issues. Overall, users tend to have a positive outlook regarding the impact of smartwatches on their health. This study may inspire both medical students and physicians to utilize smartwatches for various medical applications. Additionally, it recommends that patients consider using smartwatches as well. Both healthcare providers and patients can gain advantages from these devices that track physical activity, oxygen saturation, blood pressure, heart rate, and blood glucose levels. More research is needed to investigate the long-term impacts of smartwatch use on physical and mental health, including factors such as motivation, stress levels, and academic achievement. It is also critical to establish educational programs and campaigns to improve medical students' and healthcare professionals' skills in using Smartwatch applications in a medical setting.

List of Abbreviations:

(AI): Artificial intelligence

(SW): Smartwatches

(CVMDs): Cardiovascular and metabolic illnesses

(SpO2): Hemoglobin oxygen saturation

(COPD): Chronic pulmonary disease

(MSS): Medical students' symptoms

Ethics statement

The study received approval from the Molecular Biology Research Ethics Committee at Assiut University (IRB number 22-2024-0019), along with formal authorization from the Dean of Assiut Faculty of Medicine. The study's objectives were clearly explained on the first page of the Google form in simple Arabic, and participants were assured that their personal information and responses would remain confidential. Participation in the study was voluntary.

Authors' contributions

Ekram M Abdel Khlaek, Heba M. Mohammed and Alaa A Bader El-Deen contributed to the conceptualization, methodology, practical work, and writing of the original draft. All authors have read and approved the final manuscript and agree to its submission.

Data Availability Statement

The data are available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

Consent to Participate

All authors agree to participate.

Consent to Publish

All authors agree to publish the paper.

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