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Effect of universal health insurance implementation on beneficiaries' evaluation of public health facilities in Egypt – a cross-sectional study

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Abstract

Background Universal health coverage (UHC) is a key health policy priority to guarantee access to high-quality healthcare without causing undue financial hardship. After many attempts for health reform, Egypt has adopted the Universal Health Insurance (UHI) system in 2018. The aim of the study was to assess the effect of UHI implementation on beneficiaries' perspectives of public healthcare facilities during the early stages of implementation.

Methods A cross-sectional study was conducted from 2021 to 2022 in Egypt, with 785 participants interviewed at UHI and non-UHI areas. All participants were interviewed using a questionnaire for sociodemographic characteristics, perceived health status, insurance plan, and Patient Evaluation Scale –Short form (PES-SF). Besides, participants were asked to report their general evaluation of overall quality, accessibility, and satisfaction with the healthcare services.

Results Out of 785 participants, 326 participants were UHI beneficiaries, while 459 were non-UHI enrollees. UHI was associated with a 4.71-point increase in the mean total PES-SF score compared to non-UHC (95% CI: 3.12–6.30, $p < 0.001$). UHI was associated with an 80% and 56% increase in the likelihood of reporting a good or more overall accessibility and general satisfaction with health facilities, compared to non-UHI, respectively (OR: 1.80, 95% CI: 1.17–2.77, $p = 0.008$; OR: 1.56, 95% CI: 1.00–2.43, $p = 0.048$, respectively). However, perceived overall quality was not significantly associated with UHI status (OR: 1.13, 95% CI: 0.74–1.71, $p = 0.578$).

Conclusions The study finding shows that UHI beneficiaries perceived a higher level of overall satisfaction and accessibility than non-UHI beneficiaries. However, no significant difference exists regarding the perceived overall quality of care. These findings provide valuable insights into the effect of UHI in Egypt and can inform evidence-based policymaking to strengthen the healthcare system and advance universal health coverage objectives.

Keywords Universal health coverage, Health insurance, Perceived quality, Patient satisfaction, Accessibility, Egypt

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Introduction

Universal health coverage (UHC) is a key health policy priority to guarantee access to high-quality health care, for all, without causing undue financial hardship [1, 2]. During the last decade, UHC-driven health system reforms have been adopted by many countries, demonstrating the worldwide commitment to UHC as one of the targets of the UN Sustainable Development Goals (SDGs) [1, 3]. Egypt is a lower-middle-income country and the most populated Arab country in the Middle East –third-most-populous country in Africa –with nearly 110 million inhabitants in 2022 [4].

Egypt's current health expenditure (CHE) has been stagnant around 5.0% of GDP over the past decade, with most recent value of 4.6% for fiscal year 2019/20, equating to EGP 2,560 per capita. However, the general government health expenditure from domestic sources (GGHE-D) represents 1.5% of GDP, which is lower than the average in lower-middle income countries (2.3%) or the countries of the World Health Organization's (WHO) Eastern Mediterranean Region (EMR) (2.6%) [5–7]. Besides, Egypt has been struggling for decades with a high share of out-of-pocket (OOP) health spending comprising over 60% of CHE, fragmented health system due to fragmented regulatory, financing, and providers' structures, inefficient resource allocation, and low-quality and low utilization of public health sector services [6, 8–11].

Several attempts for health system reform were conducted in Egypt since the 1960s. Nevertheless, universal and affordable access to health care continues to be a major health policy challenge for the Egyptian government [6, 12, 13]. A groundbreaking step was the adoption of the universal health coverage (UHC) policy and promulgation of a new Universal Health Insurance (UHI) Law in 2018 [9, 12]. The UHI Law set a unified legal framework to address structural challenges of health care access and quality through establishing three new authorities to manage and reform the health care system in Egypt: the Universal Health Insurance Authority (UHIA), Egypt Healthcare Authority (EHA), and the General Authority for Healthcare Accreditation and Regulation (GAHAR) [5, 11]. The implementation of the UHI Law has commenced in 2019, with a gradual rollout plan of phased implementation across six different geographic regions in Egypt with the aim to cover the entire country by end of 2032 [12].

The main pre-Law social health insurance scheme is the Health Insurance Organization (HIO), which covers 59% of the population. HIO scheme consists of multiple fund pools for different population groups, including civil servants, retired civil servants, insured widows, pre-school children, and female-headed households, with cross subsidies restricted and subject to Ministry of Finance approval. HIO relies on the social insurance contributions from employers (47%) and employees (21%), with small amounts of funding through governmental transfers on behalf of specific groups (3.6%). In contrast, UHI relies on general government transfers (92%) [8, 11, 14].

Globally, UHC implementation has been associated with varying degrees of success. Countries such as Thailand, Rwanda, the Philippines, and Vietnam have demonstrated the transformative potential of UHC in improving access to care, reducing OOP spending, and addressing health inequities [15–19]. However, challenges such as sustaining financial resources, ensuring equitable coverage, and addressing quality gaps in healthcare delivery remain prevalent, particularly in lower-middle-income settings [20, 21].

Understanding beneficiaries' perceptions and experiences with health services under UHC reforms, particularly in the early phases of implementation, has been a critical focus in the literature. Studies from countries such as Indonesia, Ghana, and Kenya emphasize the importance of aligning service delivery with beneficiary expectations to achieve successful UHC implementation. For example, research in Indonesia highlighted beneficiaries' concerns regarding service quality and long wait times, which affected their satisfaction and utilization of public health facilities [2, 22]. Similarly, Ghana's National Health Insurance Scheme faced challenges related to perceived inequities in service provision and the quality of care at accredited facilities [23]. In Kenya, early UHC pilots revealed significant challenges in integrating services across providers, maintaining quality, and managing the expectations of a diverse population [24]. In Egypt, there is a limited number of studies examining the perspectives of beneficiaries at health facilities within the context of the new UHI system.

Therefore, the present study aims to evaluate the effect of UHI on beneficiaries' perspectives and assessments of health facilities during its initial years of implementation. Given that the UHI aims to purchase services from both public and private healthcare providers, this study focuses on the public health facilities, which serve as the primary providers during the initial years of UHI implementation. By investigating beneficiaries' experiences, this study seeks to contribute to the broader discourse on UHC implementation in lower-middle-income settings, giving significant insights for policymakers and stakeholders in Egypt and abroad.

Methods

This cross-sectional study was conducted during the period 2021–2022 in Egypt to assess the effect of the UHI implementation on perceived quality, accessibility, and overall satisfaction of health services among beneficiaries.

Two populations were identified to represent UHI and non-UHI areas: Port-Said and Al-Gharbiya governorates, respectively. Port-Said was the first governorate in Egypt to implement UHI in July 2019. It is an urban city located at the Canal region in the northeast area of Egypt with a total estimated population of 784,170 residents according to the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS) –the main statistical agency of the Egyptian government –in 2022. Al-Gharbiya is a large governorate in the north of Egypt with Tanta city serving as its capital, and an estimated population of 5,349,975 residents according to CAPMAS in 2022. To avoid selection bias, Al-Gharbiya's study population was limited to urban areas, matching the urban profile of Port-Said.

A sample size of 785 was calculated using G*Power 3.1.9.7 [25]. Calculation was based on an expected odds ratio of 1.5 for the associations between study outcomes (Y) and UHI (X) at 95% level of confidence, 80% study power, $Pr(Y=1|X=1)$ H0 of 0.50, and binomial distribution of X (0.50). A random sample of adults (18 years or older) from each population (395 from Port-Said, and 390 from Al-Gharbiya) was selected from a master sample prepared by CAPMAS.

All participants were interviewed using a questionnaire prepared by the lead author. The questionnaire included sociodemographic characteristics of study participants such as their age, gender, residence, education and marital status. Participants were asked to rate their perceived health status on a 5-point scale where 1 refers to poor health and 5 to excellent health. Besides, they were asked to report the type of health insurance, the monthly premium or cost (in EGP) of their health plan, the time-to-nearest health facility, the frequency of utilization of health insurance services per month. Patient Evaluation Scale –Short Form (PES-SF) was included in the questionnaire to assess beneficiaries' evaluation of the health services. PES-SF showed adequate validity and reliability with a Cronbach's α of 0.87 [26]. It consists of 15 items arranged in three domains: heath facility, organization, and health care. Each item is rated on a 5-point scale (i.e., poor, acceptable, good, very good, and excellent) where 1 corresponds to poor and 5 to excellent. The original English version of PES-SF was first translated into Arabic, by bilingual independent translators, using the well-established forward-backward translation method, before being pretested and used [27]. Furthermore, participants were asked to report their general evaluation of overall quality, accessibility, and satisfaction with the health services –using the same 5-point rating scale. The total score of PES-SF along with participants' evaluation of overall quality, accessibility, and satisfaction comprised the main study outcomes.

The study proposal was approved by the IRB of Harvard Faculty of Medicine (IRB21-0337) on 5/10/2021. Further approvals were granted by the Egyptian's MoHP, and Egypt Healthcare Authority before data collection.

Data was coded, entered and processed using Statistical Package for Social Sciences (SPSS version 27.0; IBM Corporation, Armonk, NY, USA). Continuous data were presented using means and standard deviation (SD), while categorical data using frequencies and percentages (%). Associations between categorical variables were tested for statistical significance using the two-sided Chi-square test, while differences in the means of continuous variables across study groups were tested for statistical significance using two-sided independent-samples t-test. Linear regression analysis was performed to test the bivariate and multivariate associations between the total score of PES-SF (dependent variable) and UHI status (independent variable), adjusting for potential confounders which yielded a statistical significance of 0.20 or less on bivariate analyses. Likewise, binary logistic regression analysis was performed to test the bivariate and multivariate associations between participants' evaluation of overall quality, accessibility, and satisfaction (dependent variables: good or above vs. poor-to-acceptable) and UHI status (independent variable), adjusting for potential confounders with a statistical significance of 0.20 or less on bivariate analyses. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 785 participants were interviewed and included in the analysis. Participants' age ranged from 18 to 88 years with an average of 41.8 (± 15.6) years, with approximately two-thirds of the participants under 50 years. Females comprised about one-third, while half of the sample had a university education or above; two-thirds were married; and 48% were employed. Approximately 84% perceived their health as good or higher; and two-thirds spend at least 500 EGP on health every month. Approximately 40% reported that they took more than 30 min to reach the nearest health facility, while about 60% have used their health insurance once a month or less in the last 12 months (Table 1).

Although 395 participants were living in Port-Said –where UHI was implemented, 69 individuals were not enrolled in the UHI due to their birthplace being elsewhere, resulting in a lack of a national ID related to Port-Said. Accordingly, the total sample is divided into a UHI group ($n=326$) and non-UHI group ($n=459$). In the non-UHI group, 181 were enrolled in public health insurance (HIO), 46 were enrolled in private health insurance, and 232 had no health insurance.

Bivariate analyses in Table 1 show statistically significant associations between UHI status and all sociodemographic characteristics: residence ($p<0.001$), gender ($p=0.003$), age ($p<0.001$), education ($p<0.001$),

Table 1 Distribution of sociodemographic characteristics and health plan among study participants by the UHI status ($n = 785$)

Characteristics		Total Sample ($n = 785$)	UHI ($n = 326$)	Non-UHI ($n = 459$)	*p*-value
			No. (%)	No. (%)	
Residence	Port-Said	395 (50.3%)	326 (100.0%)	69 (15.0%)	< 0.001*
	Al-Gharbiya	390 (49.7%)	0	390 (85.0%)	
Gender	Male	489 (62.3%)	223 (68.4%)	266 (58.0%)	0.003*
	Female	296 (37.7%)	103 (31.6%)	193 (42.0%)	
Age (years)	18–29	218 (27.8%)	142 (43.6%)	76 (16.6%)	< 0.001*
	30–39	144 (18.3%)	47 (14.4%)	97 (21.1%)	
	40–49	154 (19.6%)	52 (16.0%)	102 (22.2%)	
	50–59	147 (18.7%)	48 (14.7%)	99 (21.6%)	
	60+	122 (15.5%)	37 (11.3%)	85 (18.5%)	
Education Level	None	43 (5.5%)	0	43 (9.4%)	< 0.001*
	Primary	74 (9.4%)	15 (4.6%)	59 (12.9%)	
	Secondary	246 (31.3%)	85 (26.1%)	161 (35.1%)	
	University or above	414 (52.7%)	226 (69.3%)	188 (41.0%)	
	Not reported	8 (1.0%)	0	8 (1.7%)	
Occupation	None	65 (8.3%)	16 (4.9%)	49 (10.7%)	< 0.001*
	Housewife	120 (15.3%)	28 (8.6%)	92 (20.0%)	
	Student	103 (13.1%)	82 (25.2%)	21 (4.6%)	
	Employed/ Worker	377 (48.0%)	159 (48.8%)	218 (47.5%)	
	Business owner	120 (15.3%)	41 (12.6%)	79 (17.2%)	
Marital Status	Single	206 (26.2%)	139 (42.6%)	67 (14.6%)	< 0.001*
	Married	527 (67.1%)	169 (51.8%)	358 (78.0%)	
	Separated, Divorced, Widowed	52 (6.6%)	18 (5.5%)	34 (7.4%)	
Health Status	Poor	69 (8.8%)	21 (6.4%)	48 (10.5%)	< 0.001*
	Fair	59 (7.5%)	13 (4.0%)	46 (10.0%)	
	Good +	657 (83.7%)	292 (89.6%)	365 (79.5%)	
Monthly Spending on Health	Less than 500 EGP*	274 (34.9%)	127 (39.0%)	147 (32.0%)	0.073
	500 –1000 EGP	455 (58.0%)	181 (55.5%)	274 (59.7%)	
	More than 1000 EGP	56 (7.1%)	18 (5.5%)	38 (8.3%)	
Time-to-Nearest Health Facility	Less than 10 min	207 (26.4%)	166 (50.9%)	41 (8.9%)	< 0.001*
	10 - less than 30 min	267 (34.0%)	116 (35.6%)	151 (32.9%)	
	More than 30 min	311 (39.6%)	44 (13.5%)	267 (58.2%)	
Utilization of health insurance ($n = 533$)[1]	Never	42 (7.6%)	27 (8.3%)	15 (6.6%)	0.034*
	Less than 1/ month	400 (72.3%)	220 (67.5%)	180 (79.3%)	
	Once a month	74 (13.4%)	51 (15.6%)	23 (10.1%)	
	2–3/ month	29 (5.2%)	22 (6.7%)	7 (3.1%)	
	More than 3/ month	8 (1.4%)	6 (1.8%)	2 (0.9%)	

*. Statistically significant difference at $p < 0.05$ (Chi-square test)

[1] Participants who had no health insurance were excluded

UHI: Universal Health Insurance; EGP: Egyptian Pound

occupation ($p < 0.001$), and marital status ($p < 0.001$). UHI group had significantly higher percentages of males, under 30 years old, highly educated, students or employees, and single individuals compared to non-UHI group. Likewise, participants in UHI group reported a significantly shorter time to reach the nearest health facility than non-UHI ($p < 0.001$), and they significantly use their health insurance more frequently than other health insurance plans in the non-UHI group ($p = 0.034$). However, the association between UHI and monthly spending on health were not statistically significant ($p = 0.073$).

UHI beneficiaries reported significantly higher mean scores (total PES-SF, and facility, organization, and service domains) than non-UHI beneficiaries focusing on experiences during their most recent visit. The percentage of participants who rated PES-SF items as good or higher ranged from 63.5 to 86.2% in the UHI group, while it ranged from 52.9 to 76.0% in non-UHI group (Table 2).

The overall accessibility and general satisfaction with health facilities among UHI beneficiaries were significantly perceived as good or better more frequently than non-UHI beneficiaries ($p = 0.007$ and $p = 0.014$, respectively) (Table 3). However, no statistically significant association existed between overall perceived quality and UHI ($p = 0.178$). Based on the most recent experience, UHI beneficiaries were more likely to recommend the health facilities for their family, close friends, or coworkers, compared to non-UHI beneficiaries ($p < 0.001$).

In Table 4, bivariate analyses revealed significant associations between the UHI status and PES-SF total score ($p < 0.001$), overall accessibility score ($p = 0.034$), and general satisfaction score ($p = 0.005$). However, UHI status

Table 2 Distribution of participants' evaluation of health facilities by their UHI status ($n = 785$)

PES-SF items	UHI ($n = 326$)			Non-UHI ($n = 459$)			p-value
	Mean	±SD	% endorsing "Good +"	Mean	±SD	% endorsing "Good +"	
Facility							
Adequacy of space in waiting area	3.33	1.00	79.4%	2.72	0.92	63.2%	< 0.001*
2. Seating arrangements	3.32	0.93	82.2%	2.82	0.82	64.7%	< 0.001*
3. Suitable temperature inside	3.30	0.91	82.8%	2.85	0.80	73.9%	< 0.001*
4. Attractiveness of center	3.44	0.92	86.2%	2.87	0.95	68.2%	< 0.001*
5. Neatness of facility	3.47	0.90	85.0%	3.02	0.90	76.0%	< 0.001*
Total Subscale	**16.86**	**3.73**		**14.28**	**3.56**		< 0.001*
Organization							
1. Ease of payment	3.07	1.01	69.3%	2.85	0.96	61.9%	0.002*
2. Convenience of opening times	3.29	0.94	77.9%	3.01	0.92	72.8%	< 0.001*
3. Staff receptiveness	2.95	1.06	63.5%	2.85	0.93	67.8%	0.153
4. Staff perceived capability.	3.24	0.95	77.9%	2.99	0.91	73.6%	< 0.001*
5. Relationship with staff	3.25	0.97	77.9%	2.91	0.89	71.0%	< 0.001*
Total Subscale	**15.80**	**3.92**		**14.61**	**3.72**		< 0.001*
Healthcare service							
1. Promptness in service delivery	3.06	1.03	66.3%	2.55	0.93	52.9%	< 0.001*
2. Safety of care	3.39	0.97	82.5%	3.03	1.07	71.5%	< 0.001*
3. Consultation time	3.20	0.99	75.2%	2.84	0.94	66.7%	< 0.001*
4. Health information	3.30	0.95	80.4%	2.93	0.93	71.0%	< 0.001*
5. Clear communication	3.30	0.95	80.4%	2.93	0.93	71.0%	< 0.001*
Total Subscale	**16.24**	**3.84**		**14.29**	**4.00**		< 0.001*
Total Scale	**48.90**	**10.65**		**43.19**	**10.47**		< 0.001*

*. Statistically significant difference at $p < 0.05$ (Independent-samples t-test)

Table 3 Distribution of participants' perceived overall quality, accessibility, and satisfaction with the health facility by their UHI status ($n = 785$)

Characteristics		UHI ($n = 326$)	Non-UHI ($n = 459$)	*p*-value
		No. (%)	No. (%)	
Overall Quality of Health Facility	Poor	6 (1.8%)	19 (4.1%)	0.178
	Acceptable	60 (18.4%)	88 (19.2%)	
	Good +	260 (79.8%)	352 (76.7%)	
Overall Accessibility to Health Facility	Poor	4 (1.2%)	24 (5.2%)	0.007*
	Acceptable	51 (15.6%)	82 (17.9%)	
	Good +	271 (83.1%)	353 (76.9%)	
General Satisfaction with the Health Facility	Poor	14 (4.3%)	35 (7.6%)	0.014*
	Acceptable	62 (19.0%)	114 (24.8%)	
	Good +	250 (76.7%)	310 (67.5%)	
The chance of recommending the health facility to a family member, close friend, and co-worker	Poor	10 (3.1%)	29 (6.3%)	0.001*
	Acceptable	59 (18.1%)	122 (26.6%)	
	Good +	257 (78.8%)	308 (67.1%)	

*. Statistically significant difference at $p < 0.05$ (Chi-square test)

UHI: Universal Health Insurance

was not significantly associated with the overall quality score ($p = 0.307$). Multivariate analyses showed similar findings following the adjustment for potential confounding in our study (gender, age, education, marital status, occupation, perceived health, monthly cost/premium, and time to nearest health facility). Being enrolled in UHI was associated with a 4.7-point increase in the mean total PES-SF score, compared to non-UHI enrollment ($p < 0.001$). Additionally, UHI enrollment was associated with 80% and 56% increases in the likelihood of rating the overall accessibility and general satisfaction with health facility as good or higher, compared to non-UHI enrollment, respectively ($p = 0.008$, $p = 0.048$, respectively). However, perceived overall quality score was not significantly associated with the UHI status ($p = 0.578$).

Discussion

This study investigated the effect of UHI implementation on the perspectives of beneficiaries towards public health care facilities in Egypt. Our findings revealed that UHI

Table 4 Univariate and Multivariate associations of PES-SF, overall quality, accessibility, and satisfaction with the UHI status of study participants

Regression Models		Univariate Analysis ($n=785$)			Multivariate Analysis ($n=777$) [5]		
Outcome	**Predictors**	**B**	**95% CI**	**p-value**	**B**	**95% CI**	**p-value**
Total PES-SF[1]	**UHI** (vs. Non-UHI)	**5.71**	**4.21–7.21**	**< 0.001***	**4.71**	**3.12, 6.30**	**< 0.001***
	Female (vs. Male)	-	-	-	0.92	-0.64, 2.49	0.246
	Age > 50 (vs. ≤ 50 years)	-	-	-	-0.61	-2.27, 1.05	0.473
	Higher Education (vs. ≤ Secondary)	-	-	-	0.55	-1.00, 2.10	0.487
	Married (vs. Not Married)	-	-	-	-0.76	-2.50, 0.98	0.394
	Employed (vs. Not Employed)	-	-	-	1.23	-0.44, 2.89	0.149
	Good + Health Status (vs. Poor-to-Fair)	-	-	-	6.72	4.65, 8.79	< 0.001*
	Constant	43.19	42.22, 44.15	< 0.001*	37.30	34.67, 39.92	< 0.001*
		OR	**95% CI**	**p-value**	**OR**	**95% CI**	**p-value**
Overall Quality[2]	**UHI** (vs. Non-UHI)	**1.20**	**0.85, 1.69**	**0.307**	**1.13**	**0.74, 1.71**	**0.578**
	Female (vs. Male)	-	-	-	1.07	0.71, 1.60	0.751
	Age > 50 (vs. ≤ 50 years)	-	-	-	1.02	0.68, 1.52	0.932
	Higher Education (vs. ≤ Secondary)	-	-	-	0.98	0.66, 1.46	0.932
	Married (vs. Not Married)	-	-	-	1.02	0.65, 1.58	0.937
	Occupation (vs. None)	-	-	-	1.48	0.68, 3.23	0.320
	Students	-	-	-	1.12	0.69, 1.80	0.644
	Worker/Employee	-	-	-	1.22	0.66, 2.25	0.518
	Business Owner						
	Good + Health Status (vs. Poor-to-Fair)	-	-	-	3.27	2.10, 5.10	< 0.001*
	Monthly spending on health ≥ 500 EGP (vs. <500 EGP)	-	-	-	1.06	0.73, 1.54	0.742
	Time to Nearest Facility ≥ 30 min (vs. <30 min)	-	-	-	1.38	0.92, 2.07	0.124
	Constant	3.29	-	< 0.001	0.951	-	0.893
Overall Accessibility[3]	**UHI** (vs. Non-UHI)	**1.48**	**1.03, 2.12**	**0.034***	**1.80**	**1.17, 2.77**	**0.008***
	Female (vs. Male)	-	-	-	1.21	0.80, 1.83	0.368
	Age > 50 (vs. ≤ 50 years)	-	-	-	0.65	0.44, 0.96	0.029*
	Higher Education (vs. ≤ Secondary)	-	-	-	1.12	0.75, 1.67	0.586
	Married (vs. Not Married)	-	-	-	1.56	1.01, 2.39	0.044*
	Occupation (vs. None)	-	-	-	2.75	1.20, 6.29	0.016*
	Students	-	-	-	1.35	0.83, 2.18	0.221
	Worker/Employee	-	-	-	1.14	0.63, 2.07	0.664
	Business Owner						
	Monthly spending on health ≥ 500 EGP (vs. <500 EGP)	-	-	-	1.11	0.76, 1.62	0.578
	Time to Nearest Facility ≥ 30 min (vs. <30 min)	-	-	-	2.15	1.42, 3.25	< 0.001*
	Constant	3.33	-	< 0.001*	1.26	-	0.500

Table 4 (continued)

Regression Models		Univariate Analysis ($n=785$)			Multivariate Analysis ($n=777$) [5]		
Overall Satisfaction[4]	**UHI** (vs. Non-UHI)	**1.58**	**1.14, 2.18**	**0.005***	**1.56**	**1.00, 2.43**	**0.048***
	Female (vs. Male)	-	-	-	0.62	0.40, 0.96	0.034*
	Age > 50 (vs. ≤ 50 years)	-	-	-	0.78	0.50, 1.21	0.262
	Higher Education (vs. ≤ Secondary)	-	-	-	1.15	0.74, 1.79	0.534
	Married (vs. Not Married)	-	-	-	0.90	0.59, 1.66	0.968
	Occupation (vs. None)	-	-	-	0.61	0.26, 1.46	0.270
	Students	-	-	-	0.92	0.54, 1.57	0.759
	Worker/Employee	-	-	-	0.90	0.45, 1.81	0.773
	Business Owner						
	Good + Health Status (vs. Poor-to-Fair)	-	-	-	1.05	0.61, 1.84	0.853
	Overall Quality	-	-	-	5.32	3.06, 9.26	< 0.001*
	Overall accessibility	-	-	-	6.79	3.78, 12.20	< 0.001*
	Constant	2.08	-	< 0.001*	0.20	-	< 0.001*

*. Statistically significant difference at $p < 0.05$

[1] Model 1: Multiple Linear Regression; $R^2 = 0.123$, Model ANOVA: F(df:7,769) = 15.47, $p < 0.001$

[2] Model 2: Multiple logistic Regression; $R^2 = 0.076$; Hosmer–Lemeshow test: $\chi^2 = 8.86$, df = 8, $p = 0.355$, Overall classification = 78.2%

[3] Model 3: Multiple logistic Regression; $R^2 = 0.068$; Hosmer–Lemeshow test: $\chi^2 = 12.85$, df = 8, $p = 0.117$, Overall Classification = 79.5%

[4] Model 4: Multiple logistic Regression; $R^2 = 0.431$; Hosmer–Lemeshow test: $\chi^2 = 7.29$, df = 8, $p = 0.506$, Overall Classification = 83.5%

[5] Eight subjects were excluded because the education level was not reported

B: regression coefficient, UHI: universal health Insurance, OR: Odds Ratio, EGP: Egyptian Pound, PES-SF: Patient Evaluation Scale –Short Form

beneficiaries had significantly higher perceived overall satisfaction and accessibility to public health facilities compared to non-UHI beneficiaries. However, no significant difference was observed in perceived overall quality between UHI and non-UHI beneficiaries. Our findings align with the assumption that UHI would improve accessibility to public health facilities due to the removal of financial barriers to health services and the expansion of health care coverage [28–30].

Our finding of improved perceived satisfaction among UHI beneficiaries is in line with earlier studies from low- and lower-middle income countries (LMICs) with recent experiences of UHI implementation. A study by Abera et al. [28] compared the overall perceived satisfaction with PHC services between insured and non-insured, under community-based health insurance (CBHI) scheme in Ethiopia and reported that insured beneficiaries had a significantly higher overall satisfaction than non-insured (79.4% versus 75.7%, respectively). Likewise, evidence from Burkina Faso by Robyn et al. [31] showed that CBHI enrollment was positively associated with overall perceived satisfaction, adjusted for potential confounders. In Indonesia, Mirah and Wirawan [32] reported an improved overall satisfaction among national health insurance scheme enrollees from 67.6 to 93.2%. Fenny et al. [33] reported that a higher proportion of insured patients under the National Health Insurance Scheme (NHIS) in Ghana were satisfied with the services compared to the uninsured, but the difference was not statistically significant. In Rwanda, the introduction of CBHI significantly improved healthcare accessibility and patient satisfaction but faced challenges in ensuring consistent service quality across facilities, especially in rural areas [17]. In the Philippines, the National Health Insurance Program increased healthcare utilization among insured beneficiaries, but persistent inequities in care quality and gaps in service delivery were observed, particularly for marginalized populations [18]. These parallels show that, while UHC initiatives improve financial access and satisfaction, addressing systemic quality gaps is still a major concern. In contrast, Thailand's UHC reforms included investments in both financial protection and quality improvement, leading to significant gains in health outcomes and patient satisfaction [16].

Patient satisfaction can be viewed as both an intermediate outcome for the ultimate outcome of health improvement, and an indicator for health care quality – according to Donabedian's structure-process-outcome framework [34]. Although overall satisfaction was positively associated with UHI implementation among our study participants, no significant difference was detected in the perceived overall quality between UHI and non-UHI beneficiaries. This finding supports an earlier study by Abuosi et al. [35] who reported that there was no significant difference in the perceived general quality of care between insured and uninsured patients. However, this finding does not align with numerous previous studies reporting significant improvement in the perceived overall quality among enrollees of national health insurance systems [32]. This may be explained by the difference in the study design evaluating the same facilities before and

after UHI implementation or different facilities used by both groups (as seen in our study).

The lack of significant difference in perceived quality between UHI and non-UHI beneficiaries highlights areas for improvement. Key strategies for closing quality gaps include: (1) Continuous professional development for healthcare workers, as well as the adoption of incentives based on quality benchmarks, can improve attitudes toward UHI beneficiaries and care delivery efficiency [36]; (2) Further investments in facility infrastructure, equipment, and logistics management [24, 37]; (3) Implementing Patient-Centered Care Models through Incorporating patient feedback mechanisms and participatory approaches to quality improvement can assist ensure that services match beneficiaries' expectations [22]; and (4) Regular assessments of healthcare facilities using patient-reported and technical quality indicators can enhance monitoring and evaluation, identifying deficiencies and guiding corrective actions [24].

Although Egypt's UHI is currently in its early stages of implementation, the lack of significant difference in perceived overall quality between UHI and non-UHI beneficiaries warrants further investigation. The provision of care in UHI accredited health facility is usually associated with additional administrative work, which may affect providers' attitudes towards UHI beneficiaries and the time available for patient care [31]. Furthermore, assessment of the quality of care from the patients' perspective often lack the ability to capture other quality-related technical measures such as financial performance, logistics and staff competencies [33, 38]. Nevertheless, we further investigated patients' experiences with the quality of healthcare services in public health facilities using PES-SF which obtain deeper insight of patients' perception towards the quality of healthcare services using Donabedian's structure-process-outcome framework. Accordingly, our findings show that all items in the PES-SF among UHI beneficiaries were significantly higher than non-UHI.

This study contributes to the expanding body of knowledge on the impact of UHI, especially in LMICs. In evaluating the overall impact of UHI on health care outcomes and patient perceptions, the study emphasizes the significance of taking health service quality and accessibility into account, particularly in LMICs. It also supports the need for continuous monitoring and evaluation of UHI implementation. Furthermore, this study has several implications for health care policy and practice in Egypt and other LMICs. First, the observed benefits of UHI on beneficiaries' satisfaction and accessibility highlight the potential of UHC initiatives to improve patient experiences and promote equitable access to health care. Policymakers should prioritize efforts to sustain and expand UHC programs while addressing the challenges in the quality of care and service provision.

Despite its contributions, our study has several limitations. The cross-sectional nature of the data limits our ability to establish the temporal relations between UHI implementation and patients' perceptions. Additionally, factors that may influence patients' experiences and perceptions, such as provider perspectives and health care infrastructure, were not captured in this study. Finally, because the study was limited to two urban regions, there was a lack of understanding of beneficiaries' perspectives in rural areas.

Conclusion

This study provides valuable insights into the effect of UHI on patients' perceived satisfaction, quality, and accessibility in Egypt. By elucidating the relation between UHI and patient experiences, our findings can inform evidence-based policymaking aimed at strengthening health systems and advancing UHC objectives. Operational research using rigorous methods and exploratory qualitative research are recommended to fully comprehend the perception of UHI beneficiaries and health care providers.

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Author contributions

Conceptualization of study idea: A.S.H.; Establishing study design and methodology: A.S.H. and A.M.F.; Analyzing and Interpreting study data: A.S.H., A.M.F.; Writing the manuscript: A.S.H., A.M.F., A.Y.K., G.G.E., and A.M.; Editing and Reviewing the final manuscript: All authors. This version of the manuscript has been reviewed and approved by all authors.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The study proposal was approved by the IRB of Harvard Faculty of Medicine (IRB21-0337) on 5/10/2021. Further approvals were granted by the Egyptian's MoHP, and Egypt Healthcare Authority before data collection. This study was conducted in accordance with the Declaration of Helsinki. All participants gave their informed consent before proceeding with the study procedures.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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