



Med J Islam Repub Iran. 2024 (17 Apr);38.43. https://doi.org/10.47176/mjiri.38.43

Comparing Medical Training Costs Internationally: A Systematic Review

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Received: 15 Oct 2023 Published: 17 Apr 2024

Abstract

Background: Acquiring a thorough understanding of the expenses linked to the education of health sciences students is crucial for effective university planning, budgeting, and overall preparedness. This systematic review aimed to identify and compare the per capita costs associated with educating medical and other health science students internationally—particularly emphasizing the context of Iran.

Methods: A systematic review was conducted in 2023 according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The search covered the period from January 1, 2000, to November 11, 2022, using MeSH and EMTREE terms. Databases such as PubMed, Scopus, Web of Science, Embase, and Iranian databases were searched. Manual searches were performed using Google and Google Scholar.

Results: The study retrieved 1336 publications from bibliometric databases and, following thorough screening, included 8 relevant articles from 5 countries (Australia, Iran, United States, Thailand, and Vietnam). An additional 17 relevant articles from Iranian databases were also included. Based on USD purchasing power parity (PPP) 2019, the results show that the mean per capita cost of training a medical student for 1 academic year in Iran is \$61,493.86 (range, \$28,102-\$133,603; standard deviation, \$35,476.03). In comparison, the cost of training a medical student for 1 year is \$263,305 in the United States and \$44,674 in Australia. In Thailand and Vietnam, a 6-year medical program costs is \$284,058 and \$69,323, respectively. Moreover, according to most studies, training students in other health sciences in Iran for 1 academic year generally costs <\$20,000 (PPP 2019).

Conclusion: The study reveals that the costs associated with medical student education in Iran exceed that of most countries, second only to the United States. These findings highlight the importance of such data in improving the efficiency, sustainability, and informed resource allocation of global medical education programs for future planning and budgeting.

Keywords: Cost, Education, Medical Student, Training

Conflicts of Interest: None declared Funding: None

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Cite this article as: Aghaei Hashjin A, Irandoust K, Gholampoor H, Fischer C, Maleki Birjandi M, Mazdaki A, Abdolali H, Seval Akgün H. Comparing Medical Training Costs Internationally: A Systematic Review. *Med J Islam Repub Iran.* 2024 (17 Apr);38:43. https://doi.org/10.47176/mjiri.38.43

Introduction

The rising costs of medical education have gained considerable traction in recent times, although historical references to this concern date back to the 18th century (1,

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2). The continued increase in the cost of medical education has raised significant concerns about its impact on the field of medicine, both at the macro and microeconomic

†What is "already known" in this topic:

Previous research has explored the cost of medical education within Iran and across universities. However, there has been no previous study that compares these training costs nationally and internationally.

\rightarrow *What this article adds:*

This study provides a comprehensive analysis of the costs of medical education, both nationally and internationally. It also identifies cost differences between university faculties and between different academic disciplines. The results of the study provide valuable insights for the design of targeted reforms in the allocation of resources to undergraduate education.

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levels (3) and as a global trend, it transcends national boundaries (4).

These escalating costs have led academic medical centers to increase tuition fees due to inflated curriculum costs, thereby shifting some of the financial burden to medical students (5, 6). This shift in cost-sharing affects not just payers but also the wider community as it affects the delivery of medical services (7). To illustrate the magnitude of this issue, a comparison of tuition fees in the United States between 1992 and 2013 shows a nearly 400% increase in public medical school tuition fees and over a 180% increase in private medical school tuition fees (8). Given the rapidly changing economic and educational landscape, a comprehensive reassessment of medical education costs is essentiel. Therefore, a systematic review focusing on the costs associated with medical education is imperative. This review is essential for informed decision-making and resource optimization in a significant investment such as medical education, to benefit both students and institutions (9, 10).

This systematic review aimed to provide comprehensive insight into medical education costs and develop evidence-based policies to ensure financial sustainability. In addition, the focus on Iran in this review is significant because of its unique health and education systems, providing lessons for other countries facing similar challenges. The review also highlights the likelihood of variation in medical education costs within Iran, influenced by factors such as regional disparities, differences in infrastructure, faculty salaries, and local economic conditions. By exploring these variations and comparing them internationally, policymakers can derive essential context for effective policy and financial management practices in medical education.

Therefore, in this systematic review, the authors aimed to examine and compare the per capita cost of medical and other health science education in Iran and several other countries.

Methods

Study Design

This systematic review followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guideline (11). The completed PRISMA 2020 checklist can be found in the Appendix 1.

Search Strategy and Information Sources

The search included articles published between January 1, 2000, and November 11, 2022. Relevant publications on the cost of medical student education were identified by searching electronic bibliometric databases, including PubMed, Scopus, Web of Science, and Embase, by combining Medical Subject Headings (MeSH) or EMTREE terms with free text. Databases were searched using keywords and terms for "(cost OR price OR economic) AND (education OR teaching OR training OR curriculum) AND ((student AND medical) OR (student AND med))." The adapted database search strategies are presented in the Appendix 2.

Furthermore, the national databases Scientific Infor-

mation Database (SID) and Magiran were searched to identify relevant publications on medical education costs in Iran. A manual search of Google and Google Scholar was also conducted to identify relevant literature.

Eligibility Criteria Inclusion Criteria

The study aimed to include research that examined the costs associated with the education of medical and other health science students, focusing specifically on these costs from the provider's perspective. The scope of the search was limited to studies conducted in university and school settings.

Exclusion Criteria

Studies that calculated the clinical costs of training students in university-affiliated hospitals were excluded from the analysis. This decision was made to clearly distinguish between educational and clinical costs (12-14). In addition, articles published in bibliometric databases in languages other than English and nonoriginal papers, such as abstracts or clinical reports, were excluded. Furthermore, articles without accessible full text were not considered for inclusion.

Selection Criteria

First, duplicates were excluded using Endnote software. Then, the titles and abstracts of the included articles were checked by 2 reviewers. Unrelated articles were removed, and those suitable for full-text review were identified. Subsequently, both reviewers independently read the full text of the articles; finally, eligible articles were included in the study. A third reviewer made the final decision in case of disagreements between the reviewers.

Data Extraction

Data were extracted using an extraction table created in Excel software. The table summarizes the characteristics of the included studies and their main findings. The characteristics of the included studies include the name of the first author, year of publication, country, setting (university or school), currency, year of cost analysis, costing method (eg, activity-based costing) and time horizon. The main findings include the cost analysis results of the studies.

Data Synthesis

In this study, the cost data were converted to US dollars (USD) 2019 using the Campbell and Cochrane Economics Methods Group Evidence for Policy and Practice Information and Coordination Centre (CCEMG-EPPI-Centre) cost converter (Version 1.6, last update: April 29, 2019). This converter incorporates the International Monetary Fund (IMF) methodology for adjusting costs based on purchasing power parity (PPP) values (15).

The IMF method is used to adjust costs based on PPP. This involves converting costs to the respective country's current-year cost using the Gross Domestic Product Deflator (GDPD) index. This first step ensures that costs are adjusted to the specific year's value within the country of

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interest, considering local inflation and economic indicators captured by the GDPD index.

Having been adjusted to the current year's costs within the country, the costs are converted to USD using PPP exchange rates. These rates provide a standardized comparison by considering differences in purchasing power between countries, ensuring that costs are expressed in a common currency and reflect the actual purchasing power within each country.

Assessment of Methodological Quality

To assess the methodological quality of the included studies, we used a streamlined adaptation of Drummond et al's checklist, a tool for assessing economic evaluations endorsed by the British Medical Journal (16). The checklist was adapted to include the following key criteria:

Study Design

It examined the clarity and reporting of the study objectives, emphasizing the articulation and justification of the economic perspective (ie, the parties bearing the costs).

Data Collection

This criterion assessed the comprehensive reporting of resource use and unit cost data collection methods.

Analysis and Interpretation of Results

It focused on assessing the rigor and coherence of the authors' approaches to analyzing and interpreting the results.

Results

Screening Results

A total of 1336 articles were retrieved from bibliometric databases, including PubMed, Scopus, Web of Science, and Embase, in this study. After removing duplicates (N = 663 articles), 673 articles underwent title and abstract screening. After title and abstract screening, 45 articles remained for full-text screening. Finally, 8 articles were included in the study. After screening the relevant articles extracted from Iranian scientific databases, 17 additional articles were included in the study were reviewed using this method (Figure 1).

Study Characteristics

The reason for separately presenting the specifications of studies related to bibliographic databases is to facilitate comparisons between different countries, including characteristics such as the number of articles by country.



Figure 1. A PRISMA diagram of the search and selection process

<i>Table 1.</i> Summary characteristics of included studies from bibliometric databases						
First author (Publication	Country	Setting		Currency	Costing	Study course
year) (REF)		University	School	(Costing year)	Method	
B. Pouragha	Iran	Alborz University of	Public Health	USD (2019)	Activity-	One academic year
(2020) (29)		Medical Sciences	School		based costing	
					model	
W. P. Luan	USA	Uniformed Services	Medical School	USD (2017)	NR	One academic year
(2021) (19)		University (USU)				
M. Namazi	Iran	Shiraz University of	Medical School	IRR (2016)	Activity-	One academic year
(2021) (17, 30)		Medical Sciences			based costing	
					model	
A. J. Smolka	USA	Medical University of	College of Gradu-	USD (2011)	NR	One academic year
(2015) (31)		South Carolina (MUSC)	ate Studies			
R. K. Oates	Australia	University of Sydney	Medical School	AUD (2010)	NR	One academic year
(2013) (21, 22)						
E. Gammon	USA	University of Texas-	Medical School	USD (2007)	Construction	One academic year
(2011) (32)		Houston			model	
T Vincellert	ть .: 1 4	Chulalan alaam Unimeri	Madiaal Calaad	TUD (2000)	C:14	A
(2002) (22)	Thailand	Chulaiongkorn Universi-	Medical School	THB (2000)	Simultaneous	An academic course
(2003) (23)		ty			equation	(six years)
W. I. Dieknell	Vietnem	Thei Diph University of	Madical Sabaal	VND (1007)	A Conorol	An acadomia course
(2001) (20)	viculalli	Madiaina and Pharmaay	Medical School	VIND (1997)	izabla model	(six years)
NID not reported or incom	mrahangihla	Medicine and Pharmacy			izable illouel	(SIX years)

NR, not reported or incomprehensible.

Table 1 summarizes the characteristics of the 8 studies extracted from bibliometric databases between 2000 and 2022. These studies were conducted between 1997 and 2019 in 5 countries. Specifically, 3 studies were conducted in the United States, 2 in Iran, 1 in Australia, 1 in Thailand, and 1 in Vietnam. All included studies were cross-sectional and retrospective and mainly used an activity-based costing approach. Of the 8 studies included, 6 studies (80%) were related to medical school. They examined the costs of training medical students, and 2 studies (20%) were related to the College of Graduate Studies and the School of Public Health. All studies calculated the costs associated with medical students for 1 academic year, except 2 studies that evaluated the costs over the entire academic period (6 years) required to train a medical graduate.

Table 2 summarizes the characteristics of the 17 included studies extracted from Iranian databases between 2000 and 2022. The earliest study was conducted in 2002, while the most recent was conducted in 2019. Most studies used activity-based costing to calculate costs, except 3 studies. Most studies calculated costs for 1 academic year, except for 3 studies. A total of studies were conducted in Iran, including 2 studies from bibliographic databases (Table 1) and 17 studies extracted from Iranian databases.

Figure 2 shows the distribution of studies by university in Iran. Shiraz University of Medical Sciences had the highest number of studies (n = 4), followed by Kerman University of Medical Sciences (n = 3), and Tabriz University of Medical Sciences (n = 2). In addition, 12 universities (Alborz, Birjand, Fasa, Gonabad, Iran, Isfahan, Mazandaran, Qom, Saveh, Shahid Beheshti, Tehran, and Yazd Universities of Medical Sciences) each published 1 figure (Figure 2). Shiraz, Yazd, and Fasa Universities of Medical Sciences exceed the total number of articles because of the number of joint articles or studies. Most studies were conducted in the Faculty of Medicine and the Faculty of Management and Medical Information.

Cost Analysis

Based on the USD PPP 2019 metrics, the results of our study indicate that in the US, the per capita cost of educating a medical student for a single academic year is \$263,305, while the per capita cost of educating a biomedical graduate student ranges from \$19,882 to \$27,735. In Australia, the total cost of medical education, including infrastructure costs, was \$44,674 for 1 year of education and \$42,166 excluding infrastructure costs. In Thailand and Vietnam, the per capita cost of producing a medical graduate through a 6-year academic program was \$284,058 and \$69,323, respectively (Table 3).

Five studies independently calculated the per capita cost of medical student education in Iran. Using the 2019 USD PPP, these studies found that the per capita cost of medical student education for a single academic year was estimated to be \$57,571 in 1 study from Shiraz and notably \$133,603 in another study. In Birjand, the cost was reported to be \$28,102, while it was \$31,745 in Gonabad. Furthermore, a survey conducted in 3 universities of medical sciences, namely, Shiraz, Fasa, and Yazd, reported these costs to be \$52,793, \$74,586, and \$52,057, respectively (Table 3 & Figure 3). Consequently, the analysis shows that the mean per capita cost of training a medical student for 1 academic year in Iran is \$61,493.86 (with a maximum of \$133,603 and a minimum of \$28,102; standard deviation, \$35,476.03). Furthermore, at Mazandaran University of Medical Sciences, the per capita cost of educating all medical students, including medical and nonmedical students, was estimated to be \$42,076 (Table 3).

The results of this systematic review showed that 6 included studies were conducted in the Faculty of Management and Medical Information, reporting cost ranges for the education of students in the Faculty of Management and Medical Information at different universities. The per capita cost for 1 academic year in this faculty ranged from \$6,148 to \$30,808. This range also applies to the Faculty of Public Health and Nursing and Midwifery. In addition,

DOI: 10.47176/mjiri.38.43

Study (Publication	Country	Setting		Currency	Costing Method	Study course
vear)	country	University	School	(Costing year)	costing include	Study course
F Abedi	Iran	Biriand University of Medi-	All Schools	IRR (2018)	Activity-based	One academ-
(2022)(18)	mun	cal Sciences	All Schools	11(1((2010)	costing model	ic year
R Goudarzi	Iran	Kerman	Medical School	USD(2018)	Ton-down an-	One academ-
(2021)(33)	mun	University of Medical Sci-	Wiedlear School	05D (2010)	proach	ic year
(2021) (33)		ences			prouen	ie jeur
J. M. Nasirabad	Iran	Tabriz University of Medical	Management and Medi-	IRR (2018)	Activity-based	One academ-
(2021) (34)		Sciences	cal Information School		costing model	ic vear
A. Rostamzadeh	Iran	Tabriz University of Medical	Management and Medi-	IRR (2016)	Activity-based	One academ-
(2022) (35)		Sciences	cal Information School	· · · ·	costing model	ic year
N. Shahraki	Iran	Shiraz University of Medical	Management and Medi-	USD (2016)	Activity-based	An academic
(2021) (36)		Science	cal Information School	· · · · ·	costing model	course
R. Esmaeili	Iran	Gonabad University of Med-	All Schools	IRR (2016)	Step-Down	One academ-
(2018) (37)		ical			Method	ic year
		Sciences				-
M. T. Gholamhoseini	Iran	Kerman University of Medi-	Management and Medi-	IRR (2015)	Activity-based	One academ-
(2019) (38)		cal	cal Information School		costing model	ic year
		Sciences				
S. Moradi	Iran	Mazandaran University of	Medical School	IRR (2015)	Activity-based	One academ-
(2018) (39)		Medical Sciences			costing model	ic year
M. Rezaei	Iran	Saveh University of Medical	Nursing and Midwifery	IRR (2014)	Activity-based	One academ-
(2018) (40)		Sciences	School		costing model	ic year
S. Ghasempour	Iran	Tehran University of Medi-	Allied Medicine School	IRR (2013)	Activity-based	One academ-
(2016) (24)		cal Sciences			costing model	ic year
A. A. Haghdoost	Iran	Kerman University of Medi-	Public Health School	IRR (2011)	Activity-based	One academ-
(2014) (25)	_	cal Sciences			costing model	ic year
A. Rajabi	Iran	Shiraz, Fasa, and Yazd Uni-	All Schools	IRR (2008)	Activity-based	One academ-
(2012) (41)	-	versities of Medical Sciences			costing model	ic year
J. Kojuri	Iran	Shiraz University of Medical	Medical School	IRR (2007)	NR	One academ-
(2010) (42)	.	Sciences				ic year
K. Saeid	Iran	Istahan	Management and Medi-	IRR (2007)	Activity-based	One academ-
(2007) (43)		University of Medical Sci- ences	cal Information School		costing model	ic year
F. Ebadi Azar	Iran	Iran University of Medical	Management and Medi-	IRR (2007)	Activity-based	One academ-
(2006) (44)		Sciences	cal Information School		costing model	ic year
D. R. Mofid	Iran	Shahid Beheshti University	Dentistry School	IRR (2004)	ŇR	An academic
(2006) (45)		of Medical Sciences	5	× /		course
						(6 years)
A. Barati	Iran	Qom University of Medical	Nursing School	IRR (2002)	Activity-based	An academic
(2005) (46)		Sciences	-	. ,	costing model	course
					-	(4 years)

Table 2. Summary characteristics of included studies (Extracted from Iranian databases)

NR, not reported or incomprehensible.



Figure 2. The number of included studies by universities of medical sciences in Iran

the cost of education for 1 academic year in different faculties typically ranged from about \$100,000 to \$177,000 per student (Table 3).

In 4 of the included studies conducted in Iran, the per

capita cost of student education for Doctor of Philosophy (PhD), Master of Sciences (MSc), and Bachelor of Sciences (BSc) programs was calculated in 2019 USD PPPs. The cost per student for these academic levels ranged

Table 3. The find	lings of included studies, and the per capita cost of educating health science st	tudents		
Study (Publica- tion year)	Per capita cost of educating a student per one academic year or an academic course- indicated by * (year costing)	PPP is not con	PPP is consid- ered	
5 /		IRR2019	USD2019	USD2019
The findings from	i bibliometric databases			
B. Pouragha	For students of the Public Health faculty of Alborz University of Medical	146,206,800 R	\$3,481	\$9,273
(2020) (29) W. D. Luon	Sciences = $\$4,7/8$ US (1 USD = 30600 Rials) (2019) For Medical students of Uniformed Services University (USU) = $\$252,000$			(D62 205
(2021)(19)	per vear (more than 1 million dollars total over a 4-year curriculum) (2017)	-	-	\$205,505
M. Namazi	For Medical students of Shiraz University of Medical Sciences = 445,282,178	907,673,481 R	\$21,611	\$57,571
(2021) (17, 30)	Rials (2016)	, ,		
A. J. Smolka	For biomedical students of Medical University of South Carolina (MUSC) =	-	-	\$19,882
(2015)(31)	Lower \$17,363, Upper \$24,223 (2011) For Medical students at the University of Sydney = $$52,002$ US, and \$56,250			\$27,735 \$42,166
(2013)(21, 22)	US including infrastructure costs (2010)	-	-	\$42,100
E. Gammon	For students of the Medical faculty of the University of Texas-Houston =	-	-	\$75,145
(2011) (32)	\$61,862 US (2007)			
T.Vimolket	For producing a Medical Doctor of Chulalongkorn University = 2,161,124	-	-	\$282,364
(2003) (23)	Baht, and cost of producing a medical graduate= 2,174,091 Baht for a 6-years			\$284,058
W I Dicknell	academic course (2000) *			\$60 323
(2001)(20)	111 462 989 Dong (US\$9 527) for a 6-years academic course (1997) *	-	-	\$09,525
The findings from	Iranian databases			
F. Abedi	For students of All faculties of Birjand University of Medical Sciences =	319,782,281 R	\$7,614	\$20,283
(2022) (18)	234,437,263 Rials for all students, 324,827,214 Rials for medical students	443,077,974 R	\$10,549	\$28,102
	(2018)			
R. Goudarzi	For students of the Medical faculty of Kerman University of Medical Scienc-	1,052,126,542 R	\$25,051	\$66,733 \$40,404
(2021) (33)	es = $$18,565$ US for a parasitology PhD student, $$11,144$ US for a parasitolo- my MSe student $$7,821$ US for a mycelegy MSe student (1 USD = 42000	638,437,146 R 448,062,255 P	\$15,201 \$10,668	\$40,494 \$28,410
	(103D - 42000) Rials) (2018)	448,005,255 K	\$10,008	\$20,419
J. M. Nasirabad	For students of the Management and Medical Information faculty of Tabriz	485,724,456 R	\$11,565	\$30,808
(2021) (34)	University of Medical Sciences = 356,092,000 Rials (2018)			
A. Rostamzadeh	For students of the Management and Medical Information faculty of Tabriz	214,034,426 R	\$5,096	\$13,576
(2022) (35)	University of Medical Sciences = 105,000,000 Rials (2016)	1 500 1 (0 1 42 D	¢27 (22	£100 22 5
(2021)(36)	For students of the Management and Medical Information faculty of Shiraz University of Medical Sciences = \$25,567 US for all students, \$95,303US for	1,380,108,143 K 5 890 200 827 R	\$37,023	\$100,225
(2021) (50)	PhD students, \$20,976 US for MSc students, \$24,347 US for BSc students	1.296.421.441 R	\$30.867	\$82.227
	(1USD=30,320 Rial) (2016) *	1,504,766,057 R	\$35,828	\$95,442
R. Esmaeili	For students of All faculties of Gonabad University of Medical Sciences =	500,504,927 R	\$11,917	\$31,745
(2018) (37)	245,535,348 Rials (2016)	220 255 125 D	*= • • •	**
M. I. Ghalamhasaini	For students of the Management and Medical Information faculty of Kerman	330,275,137 R	\$7,864	\$20,948
(2019)(38)	University of Medical Sciences $-159,409,550$ Kials (2015)			
S. Moradi	For Medical students of Mazandaran University of Medical Sciences =	663,372,439 R	\$15,795	\$42,076
(2018) (39)	320,301,348 Rials (2015)		*	,
M. Rezaei	For students of the Nursing and Midwifery faculty of Saveh University of	113,560,367 R	\$2,704	\$7,202
(2018) (40) S. Chasampour	Medical Sciences = 54,596,860 Rials (2014)	272 750 807 D	\$6.404	\$17.200
(2016)(24)	For students of Affied Medicine faculty of Tenrah University of Medical Sciences = $118 312 679$ Rials for PhD students 76 714 824 Rials for MSc	272,759,897 R 176 859 553 R	\$0,494 \$4 211	\$17,500 \$11,218
(2010) (24)	students, and 42.312.537 Rials for BSc students (2013)	97.547.983 R	\$2.323	\$6.187
A. A. Hagh-	For students of the Public Health faculty of Kerman University of Medical	120,581,738 R	\$2,871	\$7,648
doost	Sciences = 31,110,000 Rials for all students, 70,370,000 Rials for PhD stu-	272,752,713 R	\$6,494	\$17,300
(2014) (25)	dents, 54,490,000 Rials for MSc students, 26,760,000 Rials for BSc students	211,202,150 R	\$5,029	\$13,396
A Dajahi	(2011) For Medical students of Shiroz, Fase, and Yord Universities of Medical	103,721,225 R	\$2,470	\$6,578
A. Kajabi (2012) (41)	For Medical students of Shiraz, Fasa, and Yazu Universities of Medical Sciences = $143 \ 172 \ 499 \ Rials \ 202 \ 273 \ 240 \ Rials \ and \ 141 \ 176 \ 854 \ Rials$	852,540,511 K 1 175 934 113 R	\$19,818 \$27,998	\$32,793 \$74 586
(2012) (71)	respectively (2008)	820,744.645 R	\$19.542	\$52.057
J. Kojuri	For Medical students of Shiraz University of Medical Sciences = 303,400,000	2,106,420,312 R	\$50,153	\$133,603
(2010) (42)	Rials (2007)		,	*
K. Saeid	For students of the Management and Medical Information faculty of Isfahan	96,944,607 R	\$2,308	\$6,148
(2007) (43)	University of Medical Sciences = $13,963,497$ Rials (2007)	120 042 020 B	¢2.072	¢0 104
r. Ebadi Azar (2006) (44)	For students of the Management and Medical Information faculty of Iran	129,042,939 K	\$3,072	\$8,184
D. R. Mofid	For students of Dentistry of Shahid Beheshti University of Medical Sciences	2,597,820.613 R	\$61.853	\$164.771
(2006) (45)	= 221,050,474 Rials for a 6-years academic course (2004) *	,,	,	,
A. Barati	For students of Nursing faculty of Qom University of Medical Sciences =	2,801,309,111 R	\$66,698	\$177,678
(2005) (46)	171,563,000 Rials for a 4-years academic course (2002) *			

*Reported for an academic course. **PPP is not considered, and the average exchange rate in 2019 according to the report of the Central Bank of Iran was used to convert Iranian Rial to US Dollar (1 USD=42000 IRR). -Studies conducted in other countries.

from \$6000 to \$66,000 for 1 academic year, with PhD education being the most expensive and BSc education being the least costly (Table 3).

Quality Assessment

All studies included in the comparative cost analysis met the British Medical Journal quality criteria for economic evaluations (16), indicating a consistently high standard across the studies. Of the 25 studies that under-



Figure 1. Per capita cost of training a medical student per one academic year in Iran based on 2019 US dollars In series 1, purchasing power parity (PPP) is considered. But in the series 2, PPP is not considered, and the average exchange rate in 2019 according to the report of the Central Bank of Iran was used to convert Iranian Rial to US Dollar (1 USD = 42000 Rials).

went qualitative assessment, all clearly defined the research question and the target population and effectively described the study setting (university/school) and location. However, in 92% of the studies (n = 23), the economic perspective was not reported, but the information provided allows interpretation. In particular, all studies were careful to report their sources of resource use and unit costs, including currency and the year of cost, as well as comprehensive methods for assessing resource use. While the majority (80%) reported sufficiently on the methodology used to estimate costs, there is room for improvement regarding this aspect. Furthermore, while all studies reported their time horizon, most focused on estimating costs within a relatively short time frame of up to 1 year. Discount rates reporting was only required in 1 study and was not done. Despite these nuances, all studies effectively addressed their research questions, drew conclusions from the reported data, and appropriately accompanied their conclusions with relevant caveats to ensure the robustness of their findings. Detailed qualitative assessment results of all included studies are presented in Table 4.

Discussion

This study was the first systematic review to synthesize the cost of medical education in Iran and internationally. Our analysis of the Iranian data suggests that health economics, particularly costing studies, is still developing in Iran and is not yet a mature decision-support tool. Notably, study methodologies were relatively limited, with activity-based costing predominant. Future studies should explore more robust costing methods to improve accuracy.

Our results revealed significant variation in the per capita cost of training medical students annually across universities within Iran and globally. Within Iran, the spectrum ranged from the highest reported cost of \$133,603 attributed to Shiraz University of Medical Sciences (17) to the lowest reported cost of \$28,102 associated with Birjand University of Medical Sciences (18). Comparatively, international variations were evident, with the US reporting the highest annual cost of training a medical student at \$263,305 (19) compared with \$69,323 in Vietnam for a 6year academic course (20). Other countries such as Australia (21, 22) and Thailand (23) reported costs of \$44,674 for 1 academic year and \$284,058 for a 6-year academic course, respectively. However, some of these discrepancies may be due to differences in study methods and cost structures between universities and countries. In addition, costs have changed significantly worldwide over the past 2 decades. Consequently, another factor contributing to these cost differences may be the different periods during which the studies were undertaken.

Furthermore, our review consistently highlighted that the per capita cost of educating PhD students exceeded that of MSc and BSc students across all programs. While the majority confirmed that PhD education was the most expensive, there were cases where the cost of educating an MSc student exceeded that of a BSc student (24, 25). Nevertheless, PhD education was generally the most expensive and BSc education the least expensive.

Participating in the costs of higher education or shifting some of these costs to parents and students is a global trend. This is evidenced by the rise in tuition fees, increased costs for essentials such as food and accommodation, and a concurrent reduction in scholarships. Studies Table 4. Results of the risk of bias assessment for included studies



suggest that the increase in tuition fees and the consequent decrease in scholarships often result from the high cost of medical education at universities (26). For instance, a questionnaire study of first- to fifth-year medical students at the Yong Loo Lin School of Medicine, National University of Singapore, revealed a total tuition fee of S\$87,450 for a 5-year medical course (27). Similarly, in Australia, an estimate based on 2015 course fees for domestic, full-fee-paying university students in Victoria found that general medicine graduates were the most expensive to train, costing \$451,000 per graduate (28). Notably, these 2 studies, which calculated the cost of medical education from the student and family perspective, were the only studies identified during the screening phase. However, they were excluded from our study because they did not meet the inclusion criteria during the full-text screening phase.

An overarching trend in Iran and other countries is the disproportionately higher cost of training medical students compared with different areas of the medical sciences. This cost disparity highlights the need for future research to explore the underlying factors driving this disparity. Efforts should be directed toward reducing unnecessary expenditures while maintaining the quality of education. To minimize expenditure while maintaining educational standards, an additional focus should be placed on scrutinizing overhead costs. In particular, since the primary objective of education is to develop skills, in this context, overhead costs add less value than direct training costs.

Limitations

Despite extensive efforts to include a wide range of data sources, such as comprehensive searches of scientific articles, published reports, and gray literature, along with attempts to obtain full texts by contacting corresponding authors when unavailable, there may be inherent limitations in the systematic review process. In addition, university websites can provide valuable information, particularly on tuition fees and other related costs. However, they may not always provide comprehensive data on the provider's perspective of the cost of education for health and medical students. Moreover, information on university websites may vary in detail, consistency, and methodology, making it difficult to conduct a standardized and thorough comparative analysis. Therefore, information from websites is not included in this study.

Furthermore, comparing historical data from the early 2000s with recent publications is an inherent challenge, given the significant changes in the cost of medical education worldwide. The evolving nature of costs over the past two decades creates complications in directly comparing older studies with more recent findings, which may affect direct comparisons of data across time periods.

Conclusion

This systematic review highlights the significant variation in the per capita cost of medical student education in different countries, with Iran's costs being higher than most countries except the US. The results of this study provide a comprehensive overview of the cost of medical student education and show significanct differences in the cost of studying medicine at different universities, both in Iran and other countries. Moreover, the cost of medical education was much higher than the cost of education in other fields, and this cost difference was significant in some universities. Most of the studies performed in Iran used the activity-based costing method, which made the studies more comparable. The information derived from the comparison of different studies in this systematic review can be helpful for health care managers and decision makers to optimize the use of resources, save costs, and increase productivity in medical education. In addition to the considerable cost difference between medical education and other fields, the cost variation within the same country highlights a pertinent concern. One way of addressing this issue might be to introduce a degree of uniformity in both cost structures and standards of provision.

Acknowledgments

None.

Authors Contributions

All authors participated in formulating the concept, executing the implementation, processing the results, and composing the manuscript.

Ethical Approval

Ethical approval is not necessary for this type of study.

Conflict of Interests

The authors declare that they have no competing interests.

References

- Walsh K. Cost in medical education: one hundred and twenty years ago. Adv Health Sci Educ Theory Pract. 2015;20(4):1107-10.
- 2. Walsh K. Medical Education: A Dictionary of Quotations: CRC Press; 2012.
- 3. Walsh K. Cost and value in medical education What we can learn from the past? J R Coll Physicians Edinb. 2014;44(4):324-7.

- Shrivastava SR, Shrivastava PS. Strategies to Reduce the Cost of Medical Education in India: A Narrative Review. Avicenna J Med. 2022;12(3):100-4.
- Grayson MS, Newton DA, Thompson LF. Payback time: the associations of debt and income with medical student career choice. Med Educ. 2012;46(10):983-91.
- Verduin ML, Balon R, Coverdale JH, Louie AK, Beresin EV, Roberts LW. The rising cost of medical education and its significance for (not only) psychiatry. Springer; 2014. p. 305-8.
- Walsh K, Levin H, Jaye P, Gazzard J. Cost analyses approaches in medical education: there are no simple solutions. Med Educ. 2013;47(10):962-8.
- Asch DA, Nicholson S, Vujicic M. Are we in a medical education bubble market? N Engl J Med. 2013;369(21):1973-5.
- 9.Gao L, Hu H, Zhao FL, Li SC. Can the Direct Medical Cost of Chronic Disease Be Transferred across Different Countries? Using Cost-of-Illness Studies on Type 2 Diabetes, Epilepsy and Schizophrenia as Examples. PLoS One. 2016;11(1):e0147169.
- Bicknell WJ, Beggs AC, Tham PV. Determining the full costs of medical education in Thai Binh, Vietnam: a generalizable model. Health Policy Plan. 2001;16(4):412-20.
- Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and metaanalysis protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4:1.2021.
- 12. Najafi Ghezeljeh T, Rezapour A, Sharifi T, Soleymani Movahed M, Teimourizad A, Yousefi Y, et al. Analysis of the education costs of nursing and midwifery students in the autonomous hospitals affiliated to Iran University of Medical Sciences. Iran Journal of Nursing. 2019;32(121):14-27.
- Nikjoo S, Rezapour A, Mojarad TBN, Kemak AR, Vahedi S, Farabi H, et al. Cost Analysis of Educational Activities of Graduate Students of Medical School in Independent Hospitals of Iran University of Medical Sciences. Sadra Medical Sciences Journal. 2021;9(2):109-18.
- Oates RK, Goulston KJ, Bingham CM, Dent OF. The cost of teaching an intern in New South Wales. Medical Journal of Australia. 2014;200(2):100-3.
- Morciano M, Thomas J, Shemilt I. A web-based tool for adjusting costs to a specific target currency and price year. Evidence & Policy A Journal of Research Debate. 2010;6(1).
- Drummond M, Jefferson T. Guidelines for authors and peer reviewers of economic submissions to the BMJ. The BMJ Economic Evaluation Working Party. BMJ: Br Med J. 1996;313(7052):275.
- Namazi M, Zare S. Calculation of the Cost of Student Education: A Case Study of Shiraz Medical School. J Adv Med Educ Prof. 2021;9(2):109.
- 18.Abedi F, Dehghani H, Zozni MA, Zengoui S, Barzi RA. Calculating the total cost of student education using the activity-based costing method at Birjand University of Medical Sciences in 2017. Journal of Afagh. 2022;5(53):99-119.
- Luan WP, Bishop J, Lindly J, Prugh G, John SK. A Methodology for Estimating the Cost of Educating Military Physicians at the Uniformed Services University. Mil Med. 2021;186(3-4):e437-e41.
- Bicknell WJ, Beggs AC, Tham PV. Determining the full costs of medical education in Thai Binh, Vietnam: a generalizable model. Health Policy and Planning. 2001;16(4):412-20.
- Oates RK, Goulston KJ. The hidden cost of medical student education: an exploratory study. Aust Health Rev. 2012;37(2):185-8.
- Goulston K, Oates K, Shinfield S, Robinson B. Medical student education: what it costs and how it is funded. Intern Med J. 2012;42(10):1149-52.
- Vimolket T, Kamol-Ratanakul P, Indaratna K. Cost of producing a medical doctor at Chulalongkorn University. J Med Assoc Thai. 2003;86(1):82-92.
- Ghasempour S, Rahimniya R, Rajabnezhad Z, Dargahi H. Calculating the final cost of student training by activity based costing in School of Allied Medicine, Tehran University of Medical Sciences. Payavard Salamat. 2016;10(1):104-18.
- 25. Haghdoost AA, Amirimoghadam M, Loloei M, BANESH MR, Sabbah F, MEHROLHASSANI MH. Cost analysis of the education of students in School of Public Health, Kerman University of Medical Sciences, Iran, using activity-based costing model. 2014.
- Johnstone DB. The economics and politics of cost sharing in higher education: comparative perspectives. Econ Educ Rev. 2004;23(4):403-10.

http://mjiri.iums.ac.ir

Med J Islam Repub Iran. 2024 (17 Apr); 38:43.

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- Ng C, Tambyah P, Wong C. Cost of medical education, financial assistance and medical school demographics in Singapore. Singapore medical journal. 2009;50(5):462.
- Segal L, Marsh C, Heyes R. The real cost of training health professionals in Australia: it costs as much to build a dietician workforce as a dental workforce. J Health Serv Res Policy. 2017;22(2):91-8.
- 29. Pouragha B, Arasteh MT, Zarei E, Abdolahi M, Sheikhbardsiri H. Cost analysis of education for students in the School of Health of Alborz University of Medical Sciences: An application of activitybased costing technique. J Edu Health Promot. 2020;9.
- 30. Zare S. Calculation of the finished price of a student's education in the non-clinical fields of Fars University of Medical Sciences and Health Services using the activity-based pricing method. Journal of Health Accounting. 2021;10(1):137-66.
- Smolka AJ, Halushka PV, Garrett-Mayer E. The faculty costs to educate a biomedical sciences graduate student. CBE Life Sci Educ. 2015;14(1):ar3.
- 32. Gammon E, Franzini L. Revisiting the cost of medical student education: a measure of the experience of UT Medical School-Houston. J Health Care Finance. 2011;37(3):72-86.
- 33. Goudarzi R, Fasihi Harandi M, Tasavon Gholamhoseini M, Ebrahimipour M. The Costs of Training Medical Parasitology and Mycology Students at Kerman University of Medical Sciences. Strides in Development of Medical Education. 2021;18(1):1-6.
- 34. Nasirabad JM, Ahari AM, Zeynali M, Hasanzadeh RB, Shadbad MB. Development of the Beyond Activity Based Costing System in Faculty of Management and Medical Informatics of Tabriz: A New Approach for Costing in Higher Education. Journal of Payavard Salamat. 2021;15(1):14-25.
- 35. Rostamzadeh A, Ahari ARM, Imani A. Analysis and estimation of the cost of educating students with Activity Based Costing approach (ABC). Qurterly Journal of Research and Planing in Higher Education. 2022;27(3):87-112.
- 36. Shahraki N, Raei B, Zare S, Rezaee R, Keshavarz DK, Bashiri F, et al. Activity Based Costing (ABC) to Calculate the Cost of Training Students in School of Management and Medical Information Sciences. Health Management & Information Science. 2021;8(1):34-9.
- 37. Esmaeili R, Kianmehr M, Tahanzade AR, Ehtiati M, Ghorbani A, Pourfatemi A, et al. Calculating the unit cost of student training at Gonabad University of Medical Sciences in 2017: Using a step-down method. Journal of Medicine and Cultivation. 2018;27\٦٩-٧٨: (میژنامه).
- Gholamhoseini MT, GOUDARZI R, Nikravesh A, Beig ZAF. Calculating the final cost of the educational services of Kerman school of Management and Information Sciences through activity-based costing. 2019.
- 39. Moradi S, Hedayatizadeh-Omran A, Janbabaei G, Alizadeh-Navaei R, Panbehchi M, Geraili B, et al. Activity based costing of educational services in faculty of medicine in mazandaran university of medical sciences, Iran, 2015. J Maz Univ Med Sci. 2018;28(163):86-92.
- 40. Rezaei M. Calculating the Cost of Student Services Through Activity Based Costing Method (ABC) in Health Area. Health Res J. 2018;3(3):147-54.
- Rajabi A. Activity Based Costing (ABC), New Outlook for Calculating Cost Price of Student's Education in Different Majors of Medical Group (Case study: Medical Science Universities of Shiraz, Fasa and Yazd). The Iranian Accounting and Auditing Review. 2012;18(64):35-.
- 42. Kojuri J, Lotfi F, Amini M, Pilevar A, Esmaeelzadeh Z. The Percapita Cost of Training Undergraduate Medical Students in Shiraz School of Medicine 2007. Strides in Development of Medical Education. 2010;7(1):9-16.
- 43. Saeid K, Azimeh G, Siavoush K. Cost estimation of students training at faculty of health management and medical informatics between 2006-2007. 2007.
- 44. Ebadi Azar F, A.Gorj H, Hadian M, M.Ahari A. Unit cost calculation of student training at different levels trough Activity Base Costing method (ABC) at the School of Management and Medical Information, Iran University of Medical Science: academic year, 2006-2007. Journal of Health Administration. 2006;9(24):23-8.
- 45. Mofid R, Semnani M, OSTAD JF. Study of Overall Cost of the General Practitioner's Doctorate Degree Course in Dentistry at Shaheed Beheshti Dental Shoo, For the Year 1382-1383. 2006.
- 46. Barati A, Karimi A, Liqvan M. The cost of training nursing students using the activity-based costing system (ABC) at Qom University of

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Med J Islam Repub Iran. 2024 (17 Apr); 38:43.

Medical Sciences in 2002. Teb va Tazkiye. 2005;57(14):44-9.

Appendix 1. PRISMA 2020 Checklist

TITLE						
Title	1	Identify the report as a systematic review.				
ABSTRACT						
Abstract	2	See the PRISMA 2020 for Abstracts checklist.				
INTRODUCTION						
Rationale	3	Describe the rationale for the review in the context of existing knowledge.				
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.				
METHODS						
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 4			
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.				
Search strate- gy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.				
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.				
Data collec- tion process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 6			
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 6			
	10b	List and define all other variables for which data were sought (e.g. participant and intervention character- istics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 6			
Study risk of bias assess- ment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7			
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	N/A			
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	N/A			
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of miss- ing summary statistics, or data conversions.	Page 6			
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 6			
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical hetero- geneity, and software package(s) used.	N/A			
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. sub- group analysis, meta-regression).	N/A			
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	N/A			
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from report- ing biases).				
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.				
RESULTS						
Study selec- tion	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 4 (Figure 1)			
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 7			

Appendix 1. PRISMA 2020 Checklist

TITLE				
Study characteristics	17	Cite each included study and present its characteristics.		
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Supplementary file 3	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	N/A	
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing stud- ies.	Page 9-10 (Table 3)	
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	N/A	
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	N/A	
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized re- sults.	N/A	
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Supplementary file 3	
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	N/A	
DISCUSSION				
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 11-12	
	23b	Discuss any limitations of the evidence included in the review.	Page 12	
	23c	Discuss any limitations of the review processes used.	Page 12	
	23d	Discuss implications of the results for practice, policy, and future research.	Page 12	
OTHER INFORMATION				
Registration and proto- col	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	Not registered	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	Not prepared	
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	Not registered	
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Listed sepa- rately	
Competing interests	26	Declare any competing interests of review authors.	Listed sepa- rately	
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Listed sepa- rately	

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

Appendix 2. Search strategies for each database

PubMed

(Cost*[ti] OR Pric*[ti] OR Econom*[ti]) AND (Educat*[tiab] OR Teach*[tiab] OR Training[tiab] OR Curriculum[tiab]) AND ((Student*[tiab] AND Medical[tiab]) OR (Student*[tiab] AND Med[tiab])) AND 2000/01/01 :2022/11/30 [dp] Result : 290 articles

Scopus

(TITLE (Cost*) OR TITLE (Pric*) OR TITLE (Econom*)) AND (TITLE-ABS (Educat*) OR TITLE-ABS (Teach*) OR TITLE-ABS (Training) OR TITLE-ABS (Curriculum)) AND ((TITLE-ABS (Student*) AND TITLE-ABS (Medical)) OR (TITLE-ABS (Student*) AND TITLE-ABS (Med))) AND (PUBYEAR > 1999 AND PUBYEAR < 2023)

Results: 330 articles Web of Science

(TI=(Cost*) OR TI=(Pric*) OR TI=(Econom*)) AND (TS=(Educat*) OR TS=(Teach*) OR TS=(Training) OR TS=(Curriculum)) AND ((TS=(Student*) AND TS=(Med))) AND PY=(2000-2022) Results: 323 articles

Embase

(Cost*:ti OR Pric*:ti OR Econom*:ti) AND (Educat*:ti,ab OR Teach*:ti,ab OR Training:ti,ab OR Curriculum:ti,ab) AND ((Student*:ti,ab AND Medical:ti,ab) OR (Student*:ti,ab AND Med:ti,ab)) AND [2000-2022]/PY Results: 393 articles