

## ORIGINAL ARTICLE

Citation analysis of graduate Dental thesis references:  
Before and after an intervention

**Background:** Introduction of Iranian National Medical Digital Library (INLM) was a huge investment during several years ago. The aim of this study was to discover the effectiveness of this scientific intervention by examination of citation pattern among graduate dental thesis during before and after of INLM accessibility.

**Methods:** This analytical study was conducted among all of graduate dental thesis at Babol University of Medical Sciences (during 2007-2010) using citation analysis. The data were collected by means of a tailor-made data collection sheet and analyzed using descriptive statistical indexes and ANOVA test.

**Results:** The outcome extracted of 111 theses and 5334 citations showed that journals were the most frequent format (80%) and there were not any statistical significant difference between numbers of cited references over the four years. Furthermore, there was not any positive effect on age of cited references.

**Conclusions:** Overall, according to limited effect on number, age and types of cited references during before and after of INLM access, it can be concluded that INLM had negligible effect on citation pattern and more research in this regard is necessary.

**Key words:** Citation analysis; Thesis; Dentistry; Iranian National Medical Digital Library (INLM).

Aram Tirgar<sup>1\*</sup>, Mohammad Bagher Abolghasemi<sup>2</sup>, Mousa Yaminfirooz<sup>3</sup>.

<sup>1</sup> Social Medicine Department, School of Medicine, Babol University of Medical Sciences, Babol, Iran

<sup>2</sup> Babol University of Medical Sciences, Babol, Iran

<sup>3</sup> General Education Department, Babol University of Medical Sciences, Babol, I.R.Iran

\* Social Medicine Department, School of Medicine, Babol University of Medical Sciences, Babol, Iran

Tel: +98 111 2190560  
E-Mail: a\_tirgar@yahoo.com

تحليل استنادی لرسالت التخرج عند خريجي كلية الأسنان :  
قبل و بعد مداخله

**التمهيد و الهدف:** إن الإستفاده من المكتبة الرقيه الوطنيه الطبيه في ايران تعتبر استثمار علمي عظيم في السنوات الماضيه. إن الهدف من هذه الدراره هو تحليل مستوى الأثر الإستفاده من المكتبة الرقيه الوطنيه من خلال مداخله علميه عبر تحليل استنادی لرسالت التخرج عند خريجي كلية الأسنان قبل استخدام هذه المكتبة و بعدها.

**الأطلوب:** إن هذه الدراره كانت بشكل تحليلي على رسالت التخرج في كلية طب الأسنان في جامعه بابل الطبيه خلال عام ١٣٨٦ حتى ١٣٨٩ هـ.ش. تم تجميع المعلومات اللازمه من خلال قسم رسالت التخرج و تم كتابه المعلومات اللازمه على استمارات مخصصه لرسالت الامر و تم تحليل المعطيات بواسطه معايير احصائيه توصيفيه.

**النتائج:** نظرا للإستعمال ٥٣٣٤ مصدر علمي في ١١١ رساله تخرج تحت الدراره عليم إن معدل استخدام المصادر في كل من من السنوات المذكوره لم يكن فيه اختلاف احصائي ملحوظ وكان هناك ارتفاع بمستوى استخدام المجلات كان ٨٠٪ و لم نثرالنتائج الى اثر ايجابي و ذوقيه في فيودسن المصادر.

**الإستنتاج:** نظرا الى العدد القليل و تغييرات السن و نوع المصادر المستخرجه في رسالت التخرج عند طلاب كلية الأسنان خلال سنوات قبل و بعد استخدام المكتبة الرقيه الوطنيه ، لم يكن اثر هذا الامر بارز و يحتاج الامر الى اتخاذ تدابير افضل برضا الشأن.

**الكلمات الرئيسيه:** تقييم الكتاب، تحليل استنادی ، رساله تخرج جامعیه ، طب انسان ، مكتبة رقيه وطنيه طبيه .

ڈیٹل شعبہ کے طلباء کے تھیسس کا ماخذ کی حیثیت سے  
تنقیدی جائزہ

**بیک گراؤنڈ:** ایران میں میڈیکل ڈیجیٹل لائبریری گذشتہ برسوں میں قائم کی گئی تھی جسے علم طب سے متعلق حلقوں نے ملک و ملت کے لئے عظیم سرمایہ قرار دیا ہے۔ اس تحقیق کا ہدف ڈیٹل شعبے کے فارغ التحصیل طلباء کے تھیسس کا ماخذ کے عنوان سے تنقیدی جائزہ لینا ہے۔ اس تحقیق میں یہ خیال رکھا گیا ہے کہ ڈیجیٹل لائبریری کے قائم ہونے سے پہلے اور بعد میں ان تھیسس کا جائزہ لیا گیا ہے۔

**روش:** اس تحقیق میں دیوار سات سے دیوار گیارہ تک بابل یونیورسٹی آف میڈیکل سائنس سے فارغ التحصیل ہونے والے طلباء کے تھیسسوں کا تنقیدی جائزہ لیا گیا۔ تھیسسوں کے مدارک و ماخذ کی فہرست تیار کی گئی اور واریانس سسٹم سے اس ڈاٹا کا تجزیہ کیا گیا۔

**نتیجے:** اس تحقیق میں ایک سو گیارہ تھیسسوں کا جائزہ لیا گیا، جن میں پانچ ہزار تین سو چونتیس ماخذ مدارک سے استفادہ کیا گیا ہے۔ ان مدارک میں سب سے زیادہ میڈیکل رسالوں سے استفادہ کیا گیا ہے۔

**سفارشات:** چونکہ تھیسسوں میں استفادہ کئے گئے ماخذ و مدارک میں ڈیجیٹل لائبریری کے قائم ہونے سے پہلے اور بعد میں کوئی خاص فرق محسوس نہیں کیا گیا ہے لہذا طلباء کی تعلیم اور تحقیق کے عمل میں یہ ڈیجیٹل لائبریری بہت زیادہ موثر واقع نہیں ہوئی ہے۔ اس لائبریری کو موثر اور مفید بنانے کے لئے اس ضمن میں تحقیقات اور مفید اقدامات کرنے کی ضرورت ہے تاکہ طلباء اور محققین اس سے بھرپور فائدہ اٹھاسکیں۔

**کلیدی الفاظ:** کتابیات، تنقیدی جائزہ ، تھیسس ۔

تحليل استنادی پایان نامه های فارغ التحصيلان دندانپزشکی : قبل  
و بعد از يك مداخله

**زمينه و هدف:** بهره برداری از کتابخانه ملی دیجیتال پزشکی ایران یکی از سرمایه گذاری های عظیم علمی طی چند سال گذشته بشمار می آید. هدف از این پژوهش، بررسی اثر بخشی کتابخانه دیجیتال ملی به عنوان یک مداخله علمی از طریق تحلیل استنادی پایان نامه های فارغ التحصيلان رشته دندانپزشکی طی سال های قبل و بعد از دسترسی به آن بوده است.

**روش:** این مطالعه بصورت تحلیلی روی کلیه پایان نامه های رشته دندانپزشکی دانشگاه علوم پزشکی بابل از سال ١٣٨٦ تا ١٣٨٩ اجرا شد. جهت جمع آوری اطلاعات، از بخش منابع پایان نامه ها رونوشتی تهیه و اطلاعات کتابشناختی استنادها روی برگه هایی تهیه شده توسط تیم پژوهش که در مطالعه مشابهی استفاده شده بود، ثبت گردید. برای پردازش داده ها از شاخص های آمار توصیفی همچون آزمون آماری آنالیز واریانس استفاده گردید.

**یافته ها:** با توجه به استفاده از ٥٣٣٤ منبع علمی در ١١١ پایان نامه مورد بررسی، میانگین تعداد منابع مصرفی طی هر یک از سال های فوق فاقد اختلاف معنی دار آماری بوده و استفاده از مجلات ضمن رشد نسبی بهتر در مقایسه با دیگر منابع، اصلی ترین نوع از منابع مورد استفاده (٨٠٪) بوده اند. نتایج همچنین گویای وقوع اثر مثبت و معنی داری در هبود سن منابع نبود.

**نتیجه گیری:** بدلیل تغییرات اندک در تعداد، سن و نوع منابع مورد استفاده در پایان نامه های فارغ التحصيلان رشته دندانپزشکی طی سال های قبل و بعد از بهره برداری از کتابخانه ملی دیجیتال، اثر این عامل تاکنون ناچیز و پژوهش های بیشتر همراه با اتخاذ تدابیر لازم به منظور بهبود منابع و بسط بهره برداری از آن ضروریست.

**واژه های کلیدی:** ، کتابسنتی، تحلیل استنادی، پایان نامه دانشگاهی، دندانپزشکی، کتابخانه ملی دیجیتال پزشکی

## INTRODUCTION

In recent years, many attempts have been made to improve scientific and updated sources access and this matter has been accompanied with changes in information getting process from universities and higher education institutes. Among these attempts, the Iranian National Medical Digital Library in 1387 was established by the Ministry of Health, Treatment and Medical Education where the accessibility to the latest published books and electronic journals of the world for all medical universities of the country became possible in a consortium framework.

Accessibility to over five thousand reliable medical publications, two hundred medical references, millions of scientific article reviews from the most reliable data bases and other resources such as theses, medical pictures, retraining courses, patient's guides, advanced intelligent medical diagnostic system are among the other unique facilities of this consortium (1).

In this manner in a rather similar step during the past months, the topic of using portal of medical digital resource (PMDR) has been discussed wherein the possibility of getting access to a vast variety of the latest medical information resources in the world without time or place limitation has been provided for the professors, researchers, students, and health care experts.

Now, one of the considerably important issues for people in charge and research and educational decision makers of universities, institutes, and that involved companies is that the easy access to scientific resources has led to an increase in using them. Has the mean age of scientific resources according to faster access to resources, followed a decrease in the mean age? Have the parts and patterns of using resources in researcher's scientific publications such as theses and articles been accompanied? Unfortunately, in contrast with the key role of this data for people in charge and decision makers (such as research and education authorities of universities), and on one hand the necessity of getting aware of using resources for determining the process of future improvements and the method of collecting and keeping resources in libraries (for library managers and librarians), the described data has not been available and has been very limited because of short duration of time of intervention and this lack is especially tangible in medical sciences field (2-4).

Citation analysis is one of the well-known methods in information giving field by which citation behavior pattern could be studied and scientific literature can be analyzed through studying variables such as number and kind of used sources, used language, antiquity of sources, and etc. however, the necessity of providing and keeping sources in libraries can be understood (5-6). For example Hojati and Khoshtarash (2004) conducted a study through citation analysis method on English publications used in articles published by Shahid Beheshti University of Medical Sciences. It has been known that 90 English journals available in the Main Library of the university have never been used in published articles and so 4 of the most cited journals have not been available among the journals of the

main library (7).

In another example in a study by Cox in 2008, through citation analysis method on dentistry graduates' theses, it became clear that dentistry students generally had used periodical and updated dentistry journals in their theses and most of the used journals were available among the journals of Faculty of Dentistry-Library (8).

In providing the vast and updated scientific sources in dentistry field (because of the considerable qualitative and quantitative development of this major in our country) considered as one of the scientific necessities of our country in the current condition during the few past years, we have continuously faced problems in providing resources in this field. In this study, the aims were 1: to examine the citation behavior in dentistry students' theses (years before and after the availability of National medical digital library) and 2: to discover the deficiencies in a way, and at the same time, to study the effect of this intervention on the condition of using scientific sources in dentistry and prove the necessary data for more precise selection and preparation of source in coming years.

## METHODS

This was an analytical cross-sectional study conducted on the Dental Sciences graduates' thesis, defended from the start of 2007 until the end of 2010, available in Main Library of Babol University of Medical Sciences. The method of the study is bibliometrics citation analysis. Citation analysis is one of the most widely used methods of bibliometrics in which the research analysis texts through counting the number of citations in different texts like journals, theses, and etc. (6). Therefore, all the theses of General Dentistry program were included in the study without exception and with thorough census. For the data collection, we prepared a draft of the references of all the theses and then the citation bibliometric data was recorded based on variables such as the type of resources, language, time of publication, and etc. on data placement papers provided previously by research team and used them in a similar study on medical students (9). It is worth mentioning that resources cited in the form of subtitles or in other parts of the theses were not taken into consideration, and just cited resources in references were recorded in data collection papers. In the next step, data was entered into the computer and analyzed by SPSS appropriately with research theories. Descriptive statistics, distribution scales and central tendency, and also variance analysis were used, the significant level was considered as  $p < 0.05$ .

## RESULTS

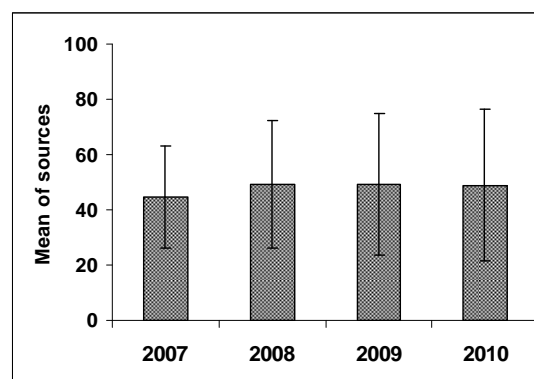
The results of the collection of used sources in 111 theses of dentistry students from 2007 to 2010 show that a total of 5334 sources have been cited during this period. Twenty, 25, and 28% of the used sources are related to every each year from 2007 to 2010, respectively.

In Table 1, the frequency of theses related to each year and the rate of some variables such as the number of used sources, the numbers of books, journals, in both Persian and English sources are presented.

**Table 1: Quantity of some of the criteria of descriptive statistic for understudy variables in the case of dentistry theses, Main Library of Babol University of Medical Sciences 2007-2010**

Educational year	Frequency	Variable	Mean ( $\pm$ SD)	Min	Max
2007	24	Number of references	44.6 (18.4)	13	90
		Number of book	9.0 (5.7)	1	23
		Number of journals	34.2 (16.6)	10	74
		Persian sources	5.5 (0.9)	1	13
		English sources	40.2 (4)	10	80
2008	27	Number of references	49.2 (23.2)	21	110
		Number of book	8.4 (4.5)	1	19
		Number of journals	38.7 (2.2)	9	100
		Persian sources	6 (6.3)	0	27
		English sources	42.4 (28.8)	7	108
2009	29	Number of references	49.1 (25.6)	10	117
		Number of book	6.5 (2.3)	3	12
		Number of journals	40 (21.9)	7	110
		Persian sources	4.7 (2.7)	1	9
		English sources	45.7 (24.7)	10	117
2010	31	Number of references	48.8 (27.4)	9	122
		Number of book	7 (4.9)	1	20
		Number of journals	39.6 (24.9)	1	104
		Persian sources	5.7 (5.8)	0	23
		English sources	43.6 (27.7)	4	115

Studying the changes occurred in the status of using sources shows that the average of the number of sources from 2007 to 2010 has changed from 44.6 to 49.2, and finally 48.8, respectively. In other words, after a tangible improvement in the average of the number sources in the first year of using the INLM, it has reached a rather stable situation. Of course, the domain of the number of used sources (the most and least used sources in the theses of each year) has increased from 77 in 2007 to 89, 107 and finally 113 in other years up to 2010 and represents a considerable change in the domain of the number of used sources. In a way, from at most recent 90 sources in 2007, it has increased to 110, 117, and 122, respectively and shows a constant growth from the point of maximum number of sources. It is worth mentioning that although using sources has improved, but one-sided variance test on the status of the variable does not show a significant difference (Figure 1). As the data in Table 1 shows, journals have always been one of the greatest part of references used among dentistry students, theses and out of the average of 48.1 resources in each thesis, almost 80% goes to journals (with the average of 38.3 resources for each thesis). Data processing also showed that almost less than 10% of the courses used related to the information taken from the internet and the

**Figure 1: The mean of used references in Dental thesis before and after using INLM.**

least part of resources from newspapers and other sources such as theses (less than 5%).

The pattern of using books in this interval was different. In contrast with the observed trend in the case of journals, using books in writing theses has a decreasing rate in its average number and the average of 9 books for each thesis

in 1386 has decreased to 6.5 and 8.4 and finally to 7 books. In other words, the share of books in dentistry theses has decreased from 20.2% in 1386 to about 13 to 14% in later years. It is worth mentioning that according to the results in all the theses, except one, at least one book has been used.

Figure 2 shows the relative frequency distribution of the used sources in theses separated by its kind. As the picture represents, no considerable change is observed in the coefficient of the users' sources.

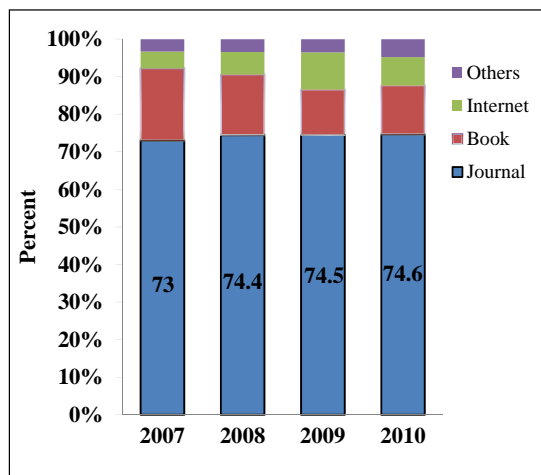
Studying the number of Persian and English used resources in the theses showed that the average of the number of Persian sources did not have a stable trend and after a small increase in 2008, it decreased in 2009 and again a slight increase in 2010. But in contrast, the average of the number

of English resources until 2009 has had a stable and increasing trend and has just reduced in 2010. Studying the statistics of using Persian sources in thesis has shown that a total of 33 dentistry theses (29.7%) do not have any Persian references.

Of course, even worse this shortage has been in the case of internet sources, theses, and newspapers. In a way, in 67 theses (60.4%) there has not been any internet sources, and in 70 theses (63.1%) other sources (such as theses or newspapers) have not been used.

In this study, the average age of the oldest and newest sources and also the average age of all the sources have been calculated. The results showed that totally the average age of the most recent resources in dentistry thesis of the past 4 years has been 2.4 years and the average age of the oldest one has been 24.3 years old. Studying the average changing trends of these quantities separated by years of study are presented in Table 2.

The results of processing this variable showed that the average age of the all used sources in 111 sources was 8.1 years.



**Figure 2: The relative frequency distribution of references in Dental thesis before and after using INLM.**

## DISCUSSION

Analyzing the data showed that the average of the number of used sources for writing theses during the years after 2008 had at least increased by 10% compared with 2007. In a way that the average of the number of sources of each thesis increased from 44.6 in 2007 and around 49 in later years (Figure 1). There are some points worth mentioning which are as follows.

A: although the 10% increase in the rate of using sources during 2008 and years after utilization of medical national digital library did not have a considerable and significant improvement in comparison with 2007 but probably some of the observed improvement can be related to the availability and accessibility of INLM.

**Table 2: Statistical criteria related to the age of sources in dentistry theses available in central library of Babol University of Medical Sciences 2007-2010**

Educational year	Frequency	Variable	Mean ( $\pm$ SD)	Min	Max
2007	24	The age of the newest source	1.6 (0.7)	1	3
		The age of the oldest source	23.2 (11)	8	49
		Total age of used sources	8.2 (4.2)	3.4	23.9
2008	27	The age of the newest source	1.4 (1.2)	0	4
		The age of the oldest source	27.5 (13.4)	8	54
		Total age of used sources	8.8 (4.5)	3.9	21.9
2009	29	The age of the newest source	1.9 (1.4)	0	5
		The age of the oldest source	27.5 (13.4)	8	54
		Total age of used sources	8.8 (4.5)	3.9	21.9
2010	31	The age of the newest source	1.7 (1.4)	1	8
		The age of the oldest source	23.3 (12.6)	5	57
		Total age of used sources	8 (3.4)	2.9	16.6

B: as the results showed (Table 1), the average of using sources in second and third years of utilization of INLM has had a similar increase as the first year (10%) and we haven't faced a considerable improvement in using the sources. In the case of the last issue, it is worth mentioning that this pattern is different from the observed condition in medical students' thesis and in contrast with the group of dentists, the average of the resources used in medicine during these two following years has had a rather stable growth (9). Not having a stable growth in the utilization of resources in dentistry thesis can be related to several factors as follows.

1. According to the writers' experience and concerned authorities of INLM has faced tangible shortcomings in the general dental courses especially those in the assisting level during the previous years.

2. The ups and downs of the utilization of INLM during the past years especially last year which have been accompanied with limitation or temporary inaccessibility for a few months.

Naturally, the other reasons can be mentioned in this case as well. For example in another study by authors with regard to using INLM in Babol University of Medical Sciences, the familiarity of faculty members and other users of university with data bases available in INLM has been less than older and more accessible data bases such as Pub Med (10). The reason of this could somehow be related to the limiter time of utilization of INLM compared with older data bases or users having been used to using data bases being accessible though Internet.

Studying the status of the utilization of journals by showing considerable changes in the number of references, expresses an improvement in using journals during the years of utilization of INLM compared to the year before that. The average number of journals used has changes from 34.2 for each thesis in 2007 to 38.7 in 2008 (by 13% increase compared to the previous year) and then 40 sources in 2009 (4% increase compared to 2008 and 17% compared to 2007). But in 1389, this process has been stopped and to some extent decreased. Inaccessibility to digital sources during a few months in 2010 can be probably one of the main reasons of this issue. The results of the conducted study among medical students' thesis in the same time period have been similar to these results with few differences (9). As it has been mentioned in the introduction, the shortage of the time of intervention or unavailability of similar data has been the obstacle to compare the current condition with other studies.

It should be mentioned that the major part of references used has been the journals, and the condition reported by other researchers and with the current condition of medical students' thesis at Babol University of Medical Sciences match harmoniously (Figure 2). Cox (2008) conducted a study through bibliometrics citation method on dentistry students' thesis in Indiana University of the USA and reported

a similar pattern (8). Or in Rashidi et al.'s study (2008) in the case of the condition of using resources in international articles published by Iranian researchers in the field of medicine, it has been mentioned that from 2002 to 2004, the journal format with 77.3% has been the highest used format and books with 18.7% got the second rank (11).

Studying the trend of increasing part of journals in all the references used has expressed an increase in this part compared to other sources and has changed from 77% in 1386 to 79% in 2008, and then to 82% in 2009.

This rate has been repeated in 2010 and journals have included 82% of the references. It seemed that if we did not encounter the problems of utilization of INLM in 2010 probably we would face higher percentage of the mentioned parts. In Siamian et al.'s study, using much higher parts of journals in theses even up to 95% has been reported (12).

The results of the status of using books in dentistry students' thesis have showed that the rate of using such sources has decreased from 9 sources in 2007 to 6.5 in 2009. A constant decrease during these years, expresses the increasing role of journals compared with books in writing thesis or research reports. It is to say that such status has been reported in other studies as well (8 and 11-12).

Studying the trend of changing the mean age of used references from 2006 to 2008 with 8.2, 7.3, 8.8, and 8 years, respectively showed a neither increasing nor decreasing mode in the mentioned variable (Table 2). This condition has been repeated in the case of the average age of the newest and oldest used sources and expresses an intangible and neutral effect in the average of the mentioned amounts. According to the restriction of the positive changes in number, age and type of most used sources in dentistry in years before and after the utilization of INLM, it can be deducted that the effect of this factor has been little and statistically insignificant so far. Naturally, the limitation of participants (one faculty member for students) and limited time of the study (because of the limited time of intervention) are considered as effective factors on not giving generalization of the results. Of course, the impossibility of differentiation between electronic and non-electronic articles used by students is another limitation of this study. Therefore, wider studies on more students and more Faculties of Dentistry and assessment of the method of using resources in dentistry residents are necessary. In order to have a much better selection of publications and data bases, and decision making strategies for better use of available resources, more studies are emphasized.

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