Assessing the Supply and Demand for Dentists in Jenin District

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Jerusalem –Palestine

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Declaration

I certify that this thesis is submitted for the degree of the Master degree, and it's the result of my own research, except where otherwise acknowledged. It also (or any part of the same) has not been submitted for a higher degree to any other universities or institutions.

Signed: 

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Date: 5. 9. 2011

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Due to this, dental profession has had a difficult time for the past ten years and the immediate future does not look so bright.

The objective of this study was to assess the imbalance between the dental workforce supply and the demand for dental services in Jenin district.

A cross sectional descriptive study was conducted between 25 August and 31 December 2010. All active dentists in Jenin private market (115 dentists) were approached yielding a response rate of 82.6% (95 dentists). The survey aimed to explore demand for dental services and productivity of dentists from different prospects; the data were analyzed using SPSS version 16.0.

Dentists supply was assessed by referring to the Palestinian Dental Association records. Future projection for dentists' supply till 2015 was done using the regression line analysis. The needed actual dentists' number was estimated using two approaches:

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The results of the study showed an increase in the dental workforce associated with a low utilization of dental services in population with decreased caries disease burden as Palestinian Ministry of Health records show. The study also showed clearly that the demand power of the population cannot absorb the continuous increase in the dentists' supply. According to the adopted ratio proposed by the WHO for developing country, which is one dentist for every 5000 inhabitants, 55 dentists are needed in 2010, while the dentists' number in 2010 was 165 dentists. In 2015, according to the proposed WHO ratio, Jenin district will be in a need for 72 dentists while the minimal projected dentists' number in 2015 was 198 dentists. A maximum of 22 dentists are needed in 2010 according to the

oral needs/ services approach. These figures strongly suggested a dentists' surplus in the market. The study findings also suggested a significant misdistribution of dentists in Jenin district with 82.1% of dentists practicing in Jenin city. This study has found an increasing role of females' dentists with participation rate of 32.6% and pinpointed the national universities as the main sources for dentists supply in Jenin district.

Depending on the results, the study emphasized the importance of planning and monitoring the dental workforces and the urgent need to control the production of dentists. In this regard special attention should be given to limit dentists' graduation from national universities. The study strongly recommended the national universities to advance the dental education towards specialty program as the study showed that the dentists are capable and willing to follow specialization programs in order to increase their proficiency and competence.

ملخص الدراسة:

تقييم العرض و الطلب على خدمات أطباء الأسنان في محافظة جنين

يحتل موضوع تخطيط القوى العاملة في مجال طب الأسنان مركزا مهما وحيويا في التخطيط الإستراتيجي للصحة الفموية في جميع أنحاء العالم حيث يطرح هذا الموضوع للتداول بشكل مستمر. ولكن مع الأسف لم يؤخذ هذا الموضوع بعين الإعتبار عند التخطيط الإستراتيجي للصحة الفموية في فلسطين، مما أدى الى مرور مهنة طب الأسنان بأوقات عصيبة على مر السنوات العشر الماضية كما أن مستقبل هذه المهنة بات مهددا في ظل غياب التخطيط الواعي لمستقبلها.

هدفت هذه الدراسة الى تسليط الضوء على البون الشاسع ما بين حجم العرض في القوى العاملة في مجال طب الأسنان وحجم الطلب على خدمات أطباء الأسنان في محافظة جنين للعام 2010.

أجريت دراسة وصفية مقطعية إستهدفت جميع أطباء الأسنان العاملين في العيادات الخاصة (115 طبيب أسنان) في محافظة جنين ما بين 25 أغسطس و 31 ديسمبر لسنة 2010 فكان معدل الإستجابة 82.6 ٪ (95 طبيب أسنان). هدفت هذه الدراسة لقياس حجم الطلب على خدمات أطباء الأسنان فتم إعداد إستبانة بحث صممت خصيصا لغرض جمع البيانات الأولية وقياس المتغيرات المؤثرة على حجم الطلب على خدمات أطباء الأسنان في محافظة جنين، وقد تم تحليل هذه البيانات إحصائياً حيث إستعان الباحث بالحزمة الإحصائية (SPSS). أما من أجل تقييم حجم أطباء الأسنان فقد تم الرجوع لسجلات نقابة طب الأسنان الفلسطينية. وللتنبؤ بحجم الزيادة في أعداد أطباء الأسنان لعام 2015 تم إستخدام معادلة الإنحدار الخطي.

أما من أجل تقدير الإحتياجات الفعلية لأطباء الأسنان في المحافظة فقد تم الإعتماد على منهجيتين:

- المنهجية الأولى: عدد السكان لكل طبيب أسنان.

- والمنهجية الثانية: قياس حجم الإحتياجات لخدمات طب الأسنان وتحويلها إلى الزمن اللازم لتقديم هذه الخدمات المكافئة لهذه الإحتياجات ومن ثم يتم تحديد عدد الأطباء اللازم لتقديم هذه الخدمات.

أظهرت نتائج هذه الدراسة زيادة ملحوظة في أعداد أطباء الأسنان مرتبطة بتدني معدل الطلب على خدمات أطباء الأسنان مع إنخفاض نسبة أمراض تسوس الاسنان في محافظة جنين كما ورد في تقارير وزارة الصحة الفلسطينية. وبينت هذه الدراسة بوضوح أن معدل إقبال الناس على خدمات أطباء الأسنان لا يرقى لإستيعاب حجم الزيادة في أعداد أطباء الأسنان. وهذا ما يظهره إختلال التوازن الظاهر ما بين إحتياجات المحافظة الفعلية لأطباء الأسنان (قياسا على المنهجيتين المذكورتين سابقا) وبين العدد الفعلي لأطباء الأسنان في المحافظة. فوفقا للنسبة المقترحة المعتمدة من قبل منظمة الصحة العالمية للبلدان النامية وهي (طبيب أسنان لكل 5000 نسمة)، نجد أن محافظة جنين بحاجة إلى 55 طبيب أسنان في عام 2010 ، في حين أن عدد أطباء الأسنان في 2010 كان 165 طبيب أسنان. أما في عام 2015 ووفقا للنسبة المقترحة تحتاج المحافظة فقط الى 72 طبيب أسنان بينما عدد أطباء الأسنان المتوقع كحد أدنى في عام 2015 هو 198 طبيب أسنان. ووفقا لمدى إحتياجات الناس للخدمات السنية تحتاج المحافظة في عام 2010 على أقصى تقدير الى 22 طبيب أسنان، وهذه الأرقام تظهر بقوة حقيقة وجود فائض في أعداد أطباء الأسنان في محافظة جنين. كما وأظهرت هذه الدراسة أيضا سوء توزيع كبيرلأطباء الأسنان في محافظة جنين حيث 82.1 ٪ من أطباء الأسنان يمارسون المهنة في مدينة جنين. وأيضا ألقت هذه الدراسة الضوء على الدور المتزايد لطبيبات الأسنان بنسبة مشاركة بلغت 32.6 ٪. كما كشفت هذه الدراسة أن الجامعات الوطنية تمثل المصدر الرئيسي لتخريج أطباء الأسنان في محافظة جنين.

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Acronyms and Abbreviations:

AAUJ: Arab American University.

Cons.: Conservative.

DHC: dental health component.

DMFT index: D; referred to decayed teeth, M; referred to missing teeth, F; referred to filled teeth, T; referred to tooth surface.

DMFS index: D; referred to decayed teeth, M; referred to missing teeth, F; referred to filled teeth, S; surfaces.

DRM: The Dental Requirements Model.

FDI: Fédération Dentaire Internationale.

FTE: number of full time equivalent.

HRP: human resources planning.

MoH: Palestinian Ministry of Health.

Ortho. : Orthodontics.

PCBS: Palestinian Central Bureau of statistics (the Census).

PCDs: professionals complementary to dentistry.

PDA: Palestinian Dental Association.

PDP: private dental polyclinics.

Perio. : Periodontology.

Prostho. : Prosthodontics.

RCT: root canal treatments.

SPSS: Statistical Packages for Social Sciences.

WB: West Bank

WHO: World Health Organization.

Chapter one

Background and Significance

1.1 Introduction

The dental profession has had a difficult time in the past ten years and the immediate future does not look so bright. The problem is a relative reduction in the people ability to raise adequate demand for dental services due to deterioration of economic situation in Palestinian Authority territories after the failure of peace process and stiffness in political situation which finally resulted in putting the whole area under siege. Concomitant also, decline in dentists' incomes. Other sides of the problem might be referred to cultural factors and community behavior and attitude towards dental care. More importantly is the dramatic decline in the incidence of tooth decay. The records of Palestinian Ministry of Health (MoH), school screening program in Jenin district from year 2004/2005-2008/2009 shows the decrease in DMFT index (D; decayed, M; missing, F; filling, T; tooth) as Figure (1.1) illustrates. Another study prepared by (Kateeb, 2007) supports this finding.

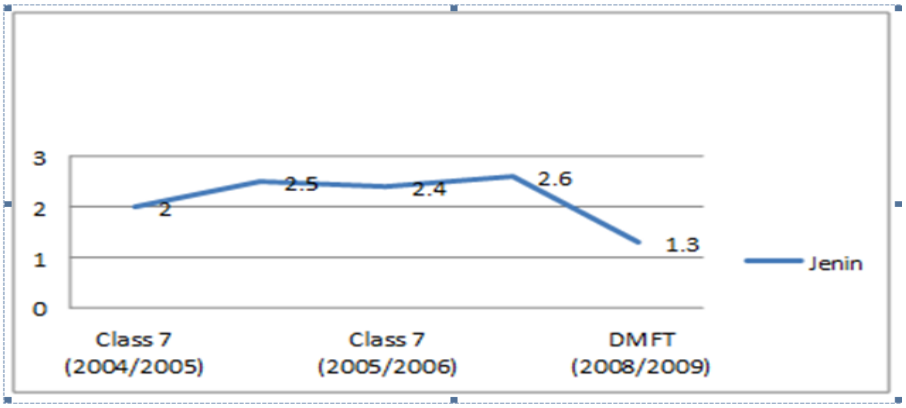

Figure (1.1): D.M.F.T within Palestinian school children's (MoH, 2010)

The advances that are made in dental science and technology increases dentists' productivity and substantial growth in the number of dental graduates. In this period of "excess" supply, it is not surprising that practicing dentists and dental educators are vitally concerned with the numbers and types of dental personal being trained, where the aim of dentistry is to meet the dental needs of the population in order to improve its health through the improvement of the oral health of its citizens. This most depends on its capacity to assure a suitable and balanced offer of competent professionals receptive to the

demands of the population. Imbalance of the dentists workforce remains today as a major concern in both developed and developing countries (Casals E, Cuenca E, 2005). However, the manifestation of oversupply of dentists shows itself strongly in Eastern Mediterranean countries. This topic has gained attention in few countries of the Eastern Mediterranean Region (Ahmed, 2000). Figure (1.2) shows Dentists per 10 000 inhabitants ratio. Referring to it, we notice the high concentration of dentists in Middle East in relation to other countries.

In Palestine and in comparison with figures from the region (see Figure 1.2), we may argue an oversupply status of dentists; this study also investigated this assumption.

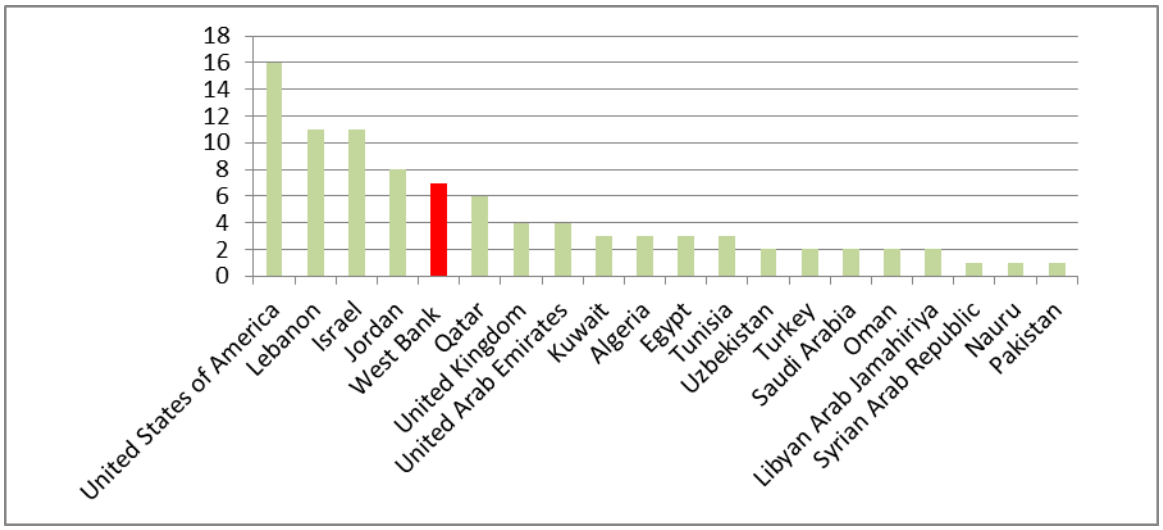

Figure (1.2): Dentists per 10 000 inhabitants ratio (WHO, 2010).

The planning of human resources in the dental services has to be an integral part of the process of health planning and should include all those processes which keep suitable balance between all needs, demands and utilization rate for dental services of population on the first hand, and the supply of suitable amount of dentists with a proper training on the other hand. It seems there is an urgent need to apply a decided policy in planning for dental human resources, subordinated to goals and needs in oral health of the West Bank population in general and specifically in Jenin population. This study intended to inform policy makers and planners by providing current estimates of demand and supply of dental services in one Palestinian district; Jenin District, with future projections of dentists supply till 2015.

1.2 Problem statement

There is continuous growth in supplying of dental workforce in the West Bank in general as well as Jenin in particular. Figure (1.3) shows continuous growth in the dentists' number from 2006-2010 in Jenin District (PDA, 2010). This increase is expected to continue due to opening two new dental schools and continuous supply of dentists from outside of West Bank. The MoH registered dentists' number is more than PDA registered dentists' number. According to the Ministry of Health, there were 1,750 registered dentists in W.B. in 2010, 325 out of them graduated from Palestinian Universities. Similarly the Palestinian Dental Association (PDA) shows a rapid growth in the number of dentists in the West Bank, where in 2006 there were 1017 dentists, increased to 1261 dentists in 2008, and increased to 1521 dentists in 2010. In Jenin, there were 135 dentists in 2006, 148 dentists in 2008, and 165 in 2010 with a growth rate in Jenin raised from 9.7% in 2008 to 11.4% in 2010. As these numbers show it is not just steady growth in the dentists' number but also an increased in growth rate (PDA, 2010).

Comparing dentists to population ratio in Palestine with other countries Figure (1.2), taking in consideration the special political and economic situation in Palestine, this gives strong suggestion that an oversupply of dentists in Palestine exists.

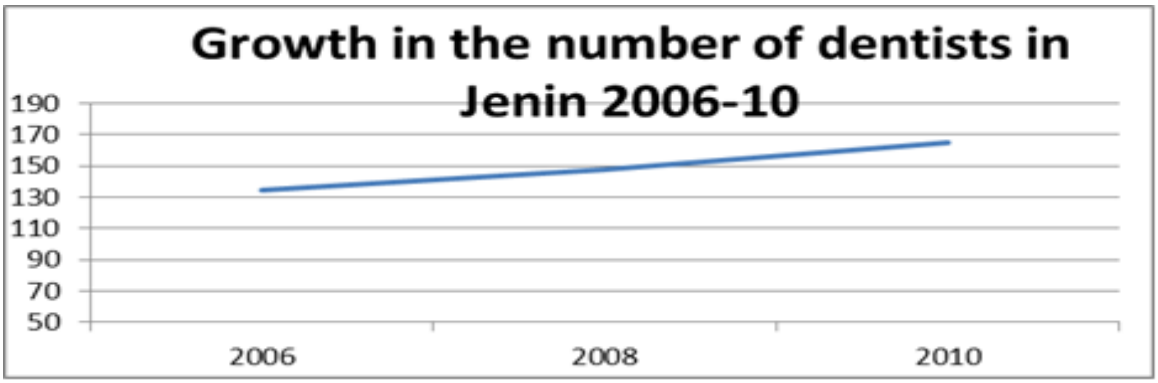

Figure (1.3): Dentists growth rate in Jenin District, Source: (PDA).

Although Jenin dentists represent 11% of all dentists working in the West Bank as (Figure1.4) shows, it has more dentists' concentration than other districts which have more dentists' number. This issue clearly shows comparisons between dentists per population ratios. For example, comparing Al Quds and Jenin dentist per population ratio shows that Al Quds dentists represent 18% out of all dentists in West Bank. However, there is one dentist for 2350 inhabitants, but in Jenin it represents 11% out of all dentists in West Bank there is only one dentist for each 1800 inhabitants which conceded relatively very high (PDA, 2010).

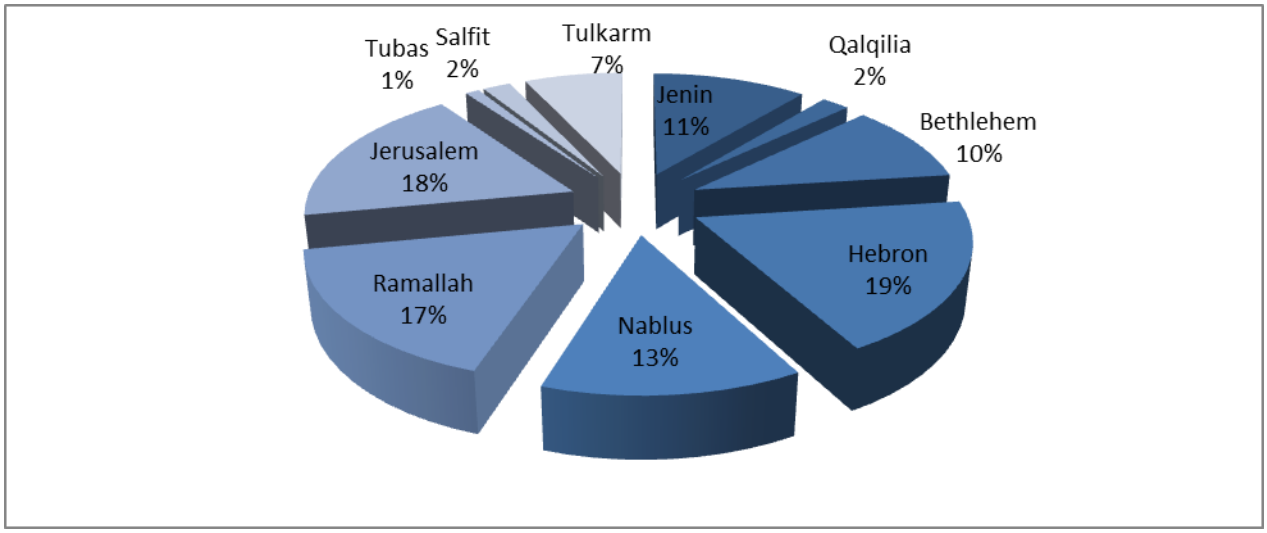

Figure (1.4): Shows distribution of dentists in WB, (PDA, 2010).

The reason behind the increase in the number of dentists in Jenin District is due to periods before the beginning of Al -Aqsa Intifada in 2000 with subsequence establishing of the separation wall and the difficulties in moving between Palestinian cities in addition to the economic hardships and political situation which compromised peoples' demand for dental care. Before this period, there was a jump in economic situation in West Bank leading to flourishing of dental market in Jenin because of the increasing number of patients from 1948 areas who were crossing from inside Israel seeking dental treatment in Jenin. All of this helped in raising the supply side of dental workforce to meet increasing demand to dental services. This situation has been changed after the events of 2000 which had negatively affected the demand for dental care and caused a drop in demand for dental services in the District leaving an excess of dentists number and imbalance in the market.

Also there is an evidence from MoH records that there was a decrease in the caries disease morbidity rate expressed by decrease in the DMFT factor (which refers for: D number of decayed, M for missing, F for filled tooth divided by existing number of teeth) among the population. This would result in decreasing the need for dentists.

The continuous growth in number of dentists and decreasing in the demand for dental care necessitates planning of the dental workforce. Therefore, there is a need to assess population dental care needs and consequently assess the number of dentists needed in order to prevent oversupply or undersupply of dental workforce. Then the study will forecast the future dentist needs in relation to the projected population needs.

1.3 Justification

Planning for human resources is the most critical area in any health reform plan. Without it, other resources can neither be exploited nor would be used efficiently. Planning for dental workforce worth paying attention from health planners due to many reasons:

- In the field of health care, preparing qualified dentists needs more time and consumes more resources in comparison to other health personnel. This situation coincides with high frequency of licensing dentists, while we can find other more demanding health care field's that need less time and resources in which we should invest Figure (1.6).

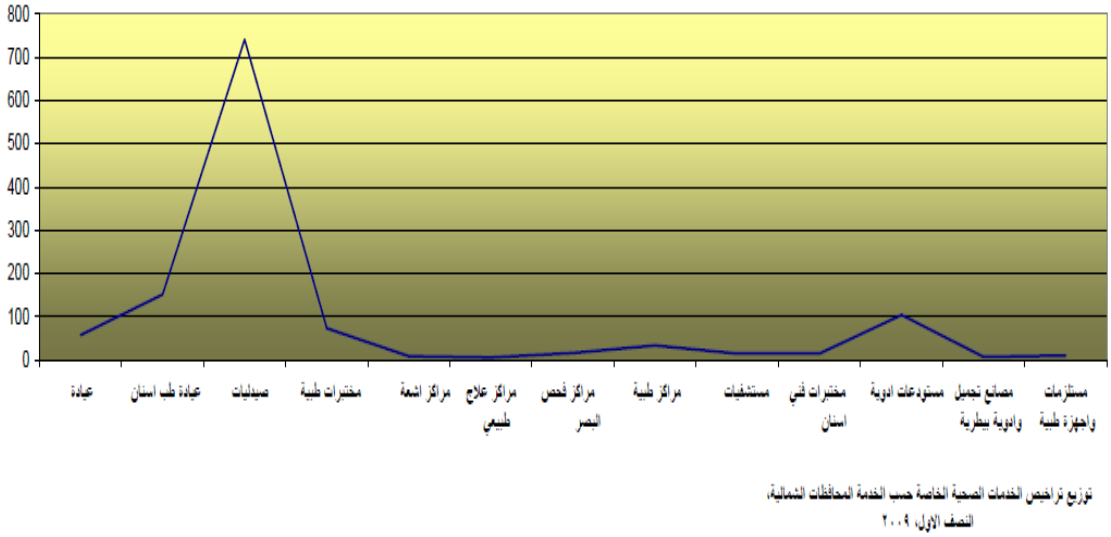

Figure (1.5): Frequency of licensing in different health categories, source: MoH, 2009

- Increasing concern about increasing unemployment of dentists and underutilization of their services, or even induced demand, due to influence of political, economic and cultural factors justifies the importance of careful planning for dentists' workforce in order to produce needed number of qualified dentists to fulfill population needs and utilization for dental services without disturbing the balance.
- In this study, Jenin district had been selected due to the high growth rate of dentist workforce: increased from 9.7% in 2008 to 11.4% in 2010, consequently it is not just steady growth in dentists' number, but it's an increase in growth rate as well (PDA, 2010).

- There is a decline in the morbidity of caries disease according to the MoH School screening program records in Jenin district from the years 2004/2005-2008/2009 where there has been decrease in DMFT index; the issue which directly influences the need for dentists' workforce.

1.4 Aim and objectives

The aim of this study is to measure current demand and supply for dental services in Jenin district and to project the future supply of dentists by 2015.

1.5 Research questions

1. What is the current supply of dental workforce in Jenin District?

2. What is the current demand for dental services in Jenin District?

3. Is there imbalance between the current supply and demand for dental services in Jenin District?

4. Is there enough demand for dental services to absorb the continuous growth in supply of dentists in Jenin Distinct?

1.6 limitations

- Dentists' are reluctant to disclose information about their private clinic activities as they might fear of the taxation issue The participant dentists were motivated by the consent form and by explaining the aim of the study and assuring them that the information would only be used for research purposes and would be treated anonymously.

- The study included only dentists in Jenin private dental market due to the shortage in resources and short time. This will limit the possibility of generalization of the results to other districts.
- The study focused on the demand for dental services rather than real dental needs of whole population, which is considerably greater than dental demand.
- Dentists supply is a dynamic process; there would be a difficulty in measuring actual dentists' supply in Jenin district because of the difficulty in isolating Jenin district from other districts.

1.7 Study Assumptions

1- The questionnaire is a valid and reliable measure of dental care demand.
2- Dentists will be cooperative and will provide valid and reliable data.

1.8 Thesis chapters' description

This thesis consists of 6 chapters. In chapter one, we will discuss the aim, problem statement, study justification and the objectives. Also, it includes study limitations. Chapter two presents the literature reviews of previous studies that are related to research topic. Chapter three discusses the conceptual framework for the study. In chapter four, study methodology, data collection methods, population size, piloting and statistical analysis of data are presented. While in chapter five, study results will be presented and demonstrated in form of tables and figures. In the last chapter (six), the study results, and its findings will be discussed and recommendations will be presented.

Chapter Two

Literature Review

2.1 Introduction

Despite the complexity of planning human resources for dental services, it is essential for a nation to adjust for the future supply of dental personnel and services (Morgan, 1994). Several industrialized countries have documented their experiences of dental planning, projections, forecasting and evaluating dental human resources during the past two decades (Goodman, 1990). The oversupply and the underemployment of dentists have been reported in many American and Scandinavian studies (Beagrie, 1986; Douglass, 1990; and Nash, 1991). During the mid1970s, many developed countries started to experience problems due to the overproduction of dentists. In 1984, the American Dental Association Special Committee on the Future of Dentistry recommended a reduction in national workforce production based on changing disease patterns, demand and need for dental services, workforce availability, and regional oversupply (Special Committee on the Future of Dentistry, 1984). Several dental schools were closed and the number of new dental graduates fell to the 1960s level. In the UK, two dental schools stopped accepting new students in 1989 in order to achieve the 10% reduction in dentists' production which was thought to be appropriate to obtain a supply and requirement balance (Chaudhry Z, 1988). The Scandinavian countries also experienced problems of dentist unemployment and underutilization of active dentists around the same time (Moore, 1986).

The start of a planning process is always submitted to a political determination, and few are the successful experiences of human health resources' planning in the field of health which are isolated from a political context. Planning without a political support is merely an academic exercise. However, there is some argument about whether there is a surplus or shortages of dentists. Different stakeholders groups also have different views of their respective task domains. Because of variations in the purpose, audience, and stakeholders involved, there are numerous methods/models of dental workforce planning each with unique advantages and disadvantages.

This section of literature review will present a review of the literature on some of the major issues involved in dental workforce planning and the various approaches to workforce planning. Then, we will review some relative studies in developing and developed countries.

2.2 Key Issues in dental workforce planning

Many factors contributed together to affect dental care market, it is important to highlight the key issues here:

- Dental morbidity: Morbidity patterns vary over time as well as by population and area characteristics (Beltran-Aguilar E., 2005). Availability of accurate and timely data on dental morbidity is therefore very important in determining dental care need of a population. Although dental morbidity data are available at the national level for certain group of age population, but this data does not include all aspects and patterns of dental diseases, creating a need for further comprehensive study on epidemiology of dental diseases. To assure the correspondence between the rate of epidemiological changes and the rate of change in workforce composition is also a challenging task.

- Need, demand, and utilization of dental care: It is important to differentiate between these concepts in dental workforce planning. Need consists of both the need perceived by an individual as well as the need determined by professional evaluation and norms. As described by Andersen:

> Any comprehensive effort to model health services use must consider how people view their own general health and functional state, as well as how they experience symptoms of illness, pain, and worries about their health and whether or not they judge their problems to be of sufficient importance and magnitude to seek professional help (Andersen, 1995) (p. 3).

While perceived need determines care seeking and adherence to treatment regimen, evaluated need is associated with the type and duration of treatment provided after the

patient has presented to a provider. Although at times used interchangeably in the literature (Grembowski, 1985; Locker, 1989; Manning, 1986). Demand and utilization are also two distinct concepts. It has been suggested that demand should comprise seeking of dental care by patients, resulting directly from the perceived or subjective need for dental treatment (Davis, 1982; Dworkin, 1978; Spencer,1980). Utilization, on the other hand, should refer to the amount of dental care consumed or purchased as a result of decisions arrived at jointly by the patient and the dentist (Feldstein, 1973; Grytten, 1992). Furthermore, it is vital to note, particularly from the policy perspective, that what is needed may not always be translated into demand.

- Dental workforce productivity: There is a great degree of variation in dental workforce productivity in terms of age and gender of dentists, number of dental hygienists and auxiliary personnel in a practice, and practice size and location (American Dental Association, 2003). Productivity also varies by specialty and market conditions. Changes in technology, practice patterns, and length of professional life pose additional challenges for dental workforce productivity estimation.

- Supply and distribution of dental personnel: In planning dental workforce for a defined geographical area, both number and distribution of dental personnel need to be considered simultaneously.

- Capacity of educational institutions: In most instances, educational institutions find it difficult to quickly change supply of new dental professionals in response to workforce projections, particularly if it involves increasing the supply. Resource and physical capacity constraints limit how much an institution can increase its class sizes and the increase may not keep pace with the demand of the market (Tira, 2003). Responses of educational institutions/training programs to changes in market demand also depend on the length of time and complexity involved in training a particular type of dental professional (Brown, 2005).

- Market capacity and characteristics: Unique market characteristics and issues related to need, demand and utilization discussed above are major determinants of the accuracy of any workforce planning model. Therefore, these issues need to be very carefully considered in choosing the appropriate workforce modeling method and time horizon (for forecasting models). Migration of both patients and personnel also make workforce planning for specific markets challenging. It is also important to recognize that

specific market boundaries often do not coincide with the administrative boundaries by which epidemiological and demographic data are usually available (University of Missouri-Kansas City, 2006).

2.3 Workforce planning methods

Health workforce planning focuses on determining the appropriate numbers, types, and distribution of personnel capable of providing services to achieve a desired goal or health outcome (Arnljot, 1985). However, variations in need and demand (owing to various demographic, economic, and epidemiologic factors) require differing workforce sizes and configurations for different populations/areas (Oral health workforce planning for developed countries, 2005). Forecasts and projections of workforce also significantly vary depending on the sponsors, intended use, degree of subjectivity, and most importantly, the methodology (Goodman &Weynet, 1990). Goodman and Weyant (1990) identified the three most commonly used methods in dental workforce estimation: 1) dentist-to-population ratios, 2) demand-based models, and 3) need-based models. Other types of models identified in the literature include dentist opinion surveys and econometric studies of practice productivity as well as scenario-based approaches where elements from other approaches are combined (DeFriese, 1982; Scotland, 2004) another models suggested by Mumma for detection of dental surplus and shortage (Henderson, 1976). However, other classifications of workforce models also generally conform to Goodman and Weyant's description (Capilouto, 1995).

2.3.1 Dentist-to-population ratio:

This has served as the traditional measure of need for dental personnel. It is simply a count of dentists presented in a given population. For workforce planning purposes, the calculated ratio is compared with an "accepted" or "standard" ratio. This study depended on recommended ratio for developing countries by the World Health Organization (WHO) in 1985 where 1 dentist was recommended for 5000 inhabitants (Joint WHO/FDI Working Group, 1989). Using this tool to project future dentists' numbers, the estimations of production of new professionals from the dental schools' intake data, the possible dentists

supply from outside the estimated attrition rate are calculated. Regarding the population data estimations are made from the census and the estimated projections can be calculated annually until the date of reference. This type of study is relatively simple; however, it is now considered unsuitable by many for forecasting personnel requirements. The major disadvantage of this method is that it fails to take into account the changing need and demand for dental care in a population over time. On the supply side, it does not accurately capture differences in providing productivity and specialty mix. The derivation of an "accepted" or "standard" ratio is also quite arbitrary (University of Missouri-Kansas City, 2006).

2.3.2 Demand-based models:

In this method, estimates are based on the current levels of dental services utilization and behavior patterns of consumers in the dental marketplace. Data analysis of a series of variables is carried out in order to relate them with the "output procedures" measured in the form of visits (patients treated and time consumed for a determinate period) so to relate these variables with the utilization or demand of oral health services. This type of approach assumes that it is the offer of professionals the one that defines the demand and not the opposite. This method provides a substantial refinement to dentist-to-population ratio estimates, however the major disadvantage lies in trying to apply a demand based approach to the dental care market that violates several fundamental assumptions of a perfectly competitive market, and basing the question in the subject of productivity instead of health goals is always arguable in a health profession. Furthermore, estimating demand from utilization data raises many methodological concerns (Casals E, Cuenca E, 2005; University of Missouri-Kansas City, 2006).

2.3.3 Need-based models:

Need based studies are based on epidemiological measures of oral disease levels in the population and the corresponding "normative" dental service needs that are professionally determined. The major advantage of this method is that the estimates are not tied to price

and hence not dependent on price-related market supply or demand; the disease status of the population is the key element here.

From a public health perspective, this method is superior because it allows prioritization of treatments and evaluation against certain population health objectives (University of Missouri-Kansas City, 2006). On the other hand carrying out this type of study is very complex. Among others, there is the difficulty of translating the detected needs into populations' expressed demands for treatment (Casals E, Cuenca E, 2005).

2.3.4 Opinion surveys among professionals:

A professional questionnaire is developed in order to get a description of the characteristics and professional structure of dental practices. According to the answers and opinions of the professionals related to their capacity of increasing their productive strength, conclusions are taken out in relation to the surplus or shortage of dental professionals. The main inconvenient of this kind of studies is the possible opinions biases of the polled professionals.

2.3.5 Mumma approach:

The method suggested by Mumma has been considered as the basic unit of measurement for the number of patients visits per year. Independent estimates are made by the number of patient visits per year supplied by dentists and utilized by residents of a given area. The difference between these two estimates represents the number of dental visits utilized by the area population but not supplied by the area dentists (-) or vice versa (+). When the number of visits supplied differs from the number utilized, it is due to consumers crossing area boundaries to seek dental care. If the difference in number of visits is divided by the number of patient visits supplied per year by the average dentist, it can be converted into numbers of dentists.

The busyness index for an area was calculated by averaging the busyness indices for all dentists in the area obtained from the survey. The index for the individual dentist was self-reported on a scale from one to four, where the number "one" indicated that the dentist

wished he had more patients and the number "four" indicated that the dentist was too busy to treat all patients requesting care (Henderdon, 1976).

2.4 Previous studies

Considerable attention has been given in planning for dental human resources in developed country. Recently, it attracts attention in developing countries. In this literature review we will review some studies in developing and developed countries.

Doughan, et al (2005) conducted a study in Lebanon in order to Estimate requirements for dentists in Lebanon for the year 2015 using the World Health Organization/World Dental Federation planning model. The aim was to help decision- and policy-makers in Lebanon to plan strategically for the supply of dental personnel in line with the recommendations of the Oral Health National Plan guidelines from 1995. Assumptions based on previous research in selected populations were taken to support the simulation. The number of dentists required for Lebanon in the year 2015 was estimated to be 2715 while the projected supply will be 6176. Urgent measures are needed to reduce the potential oversupply of dentists in this country (Doughan, 2005).

Another study conducted by Khan et al (1991) in Zimbabwe as a model for developing countries for projecting dental workforce. The authors pointed four broad methods classified by Hall which are: 1- population ratio methods. 2-service targets approach. 3-health needs approach. 4- Economic effective demand approach. And in order to estimate dental workforce requirement they used two of the most commonly employed methods and one new approach. The projection approaches using the three methods were all different, and even the lowest projection is beyond the resources of the country. Methods used in this study:

1) Dentists to population ratio; they used this relationship to determine the number of dentists (N): $N=P\times r$, where P is population, r the required ratio.

In 1988 there were 113 practicing dentists in Zimbabwe (population were 8639674) making the ratio of the number of dentists to population 1:76457 and the projected dental workforce requirement for 2002 based on population of 12482434 and a ratio of 1:20 000 is 624 dentists. Zimbabwe therefore needs additional 511 dentists by the year 2002 (based on 1987 level).

2) Health need service approach: It depends on previous epidemiological studies calculating DMFT factor and measuring educational level and attitude of population toward dental care and all administrative aspect which might be of dentist's job they assume needed time to achieve this work and divided by time that dentists can work and see if there is a shortage or access in term of dentists to cover this time. According to this, there are 270 dentists required (493214 hours/1832 hours per worker) to carry out 493214 hours of work per year. At 1988 there were 30 dentists employed by ministry of health, a total 240 dentists therefore needed.

3) WHO/FDI workforce projection approach: It depends on computer program prepared by WHO/FDI to perform necessary calculation. This program converts oral health needs into full time equivalent of oral health personal and based on this it calculates the career needed. As input the program required data collected by oral health needs assessments surveys. According to the results of this program in 1993 they will need 353 dentists in 2002 they will need 426 dentists. All three methods for determining health workforce projections indicate that a minimum of 16 dentists will have to be produced every year to fulfill the requirement of Zimbabwe (Sithole W.D., 1991).

Pratima Kissoon- Singh submitted a thesis for a master degree to the department of community dentistry from university of Pretoria In Republic of South Africa with title of (Planning oral health human resources for the provenance of KwaZulu-Natal) The aim of this study was to plan human resources for oral health care for KwaZulu-Natal using the basic primary oral health care package. This would ensure equitable distribution and optimal utilization of personnel in meeting the oral health need of this provenance. The computerized oral health personnel planning model of the WHO was used to calculate optimal numbers of human resource required for the provenance of this package. These results show gross shortage of personnel (Kissoon- Singh, 2001).

Punyasingh et al (1995) conducted a study to project dentists' manpower requirements in Thailand. This study is intended to compare the dental health personnel supply to the requirement in each 5-years interval from 1995 to 2015. The dental health personnel supply was calculated by subtracting the annual personnel loss from the current active personnel plus the annual personnel production. The results showed that there would be 10,100 dentists and 7,718 dental nurses in supply by 2015. The personnel requirement was calculated using 3 different techniques; the population ratio technique, the FDI/WHO technique, and the system dynamics technique. The dental personnel to population ratio of 1:5,000 were used to calculate the personnel requirement in the population ratio technique. The FDI/WHO and the system dynamics techniques calculated the personnel requirement by converting the needs of services into the need for personnel. While the FDI/WHO technique calculated the need for service based on the lifetime of care for each age cohort, the system dynamics technique calculated the need for service which changed with the alternations in the input factors such as the socioeconomics of the population, the trend of oral diseases, and the structure of health care system. From these three techniques, the requirement for dentists' ranges from 8,920 to 9,748 and for dental nurses ranges from 3,046 to 10,974. The results show that in the year 2015, the supply of dentists exceeds the requirement regardless of what technique is used. Similarly, the supply of dental nurses is higher than the requirement when the calculations are done using the population ratio technique and the system dynamics technique. However, the dental nurses will be in shortage according to the FDI/WHO technique. The reason for this different outcome is that dental nurses in the FDI/WHO technique provide health promotion and health education services as well as preventive and simple curative services; while in the other two techniques they provide only preventive and simple curative treatment (Punyasingh, Udompanich, & Lexomboon, 1995).

Another study conducted in the Department of Community Dentistry, Hebrew University-Hadassah School of Dental Medicine, Jerusalem (Mann J, 2003), to evaluate the need for an additional dental school in Israel. In this study they are discussing the data in 2002 that indicates a transition from oversupply reports 10 to 20 years ago to a present undersupply of dentists with a forecast for further shortage in the near future. In this study they expect that there might be a change in the status of the dental profession in Israel in the near future. Among these are the changing role of female dentists in the profession, increasing

age of practicing dentists, obligatory state licensing exams, less immigration of dentists and the natural growth of the population. Together with the expected increase of demand for dental care, a decrease in the number of dentists in Israel will result in a balanced dental manpower in 2011. Therefore, the necessity of establishing a third dental school in Israel was brought to discussion. Dental schools are responsible not only for students qualification as caregivers, but also for enrichment of practicing dentists with updated data and qualifying specialist dentists in the various fields of the profession. At the present, there is no justification for establishing a third dental school in Israel. Nevertheless, it is obligatory to maintain and strengthen the two existing dental schools in spite of the needed high costs. Only by this way, the profession will continue to enjoy a nation high quality professional and academic dental manpower. The continuous qualification of specialists will be maintained and an opened "path" will be available for future manpower enlargement. Hastiness and rashness, which ended in national shortage of dentists in other countries, should be avoided in Israel (Mann, 2003).

A study conducted by Preventive Dental Sciences Department, Faculty of Dentistry, King Abdul-Aziz University, Jeddah, Saudi Arabia, titled orthodontic treatment needs in western region in Saudi Arabia. The study aimed at evaluating self-perceived and actual need for orthodontic treatment that helps in planning orthodontic services and estimating the required resources and workforce. A consecutive sample of 743 adults seeking orthodontic treatment at two different types of dental practices in Jeddah; King Abdul-Aziz University, Faculty of Dentistry (KAAU) (Free treatment) and two private dental polyclinics (PDP) (Paid treatment), was examined for orthodontic treatment need using the dental health component (DHC) of the IOTN. The results revealed that among the 743 patients studied, 60.6% expressed no or slight need for treatment, 23.3% expressed moderate to borderline need and only16.1% thought they needed orthodontic treatment. Comparing these estimates to professional judgments, only 15.2% conformed to little or no need for treatment, 13.2% were assessed as in borderline need and 71.6% were assessed as in need for treatment ($p < 0.001$). In conclusion: Patient's perception to orthodontic treatment does not always correlate with professional assessment. The IOTN is a valid screening tool that should be used in orthodontic clinics for better services especially, in health centers that provide free treatment. (Hassan, 2006).

A systematic review was conducted of the literature on human resources planning (HRP) in dentistry in Canada, critically assessing the scientific strength of 1968-1999 publications. Inclusion and exclusion criteria were applied to 176 peer-reviewed publications and "grey literature" reports. Thirty papers were subsequently assessed for strength of design and relevance of evidence to objectively address HRP. Twelve papers were position statements or experts' reports not amenable for inclusion in the system. Of the remaining 18 papers, 4 were classified as projections from manpower-to-population ratios, 4 as dental practitioner opinion surveys, 8 as estimates of requisite demand to absorb current capacity and 2 as need-based, demand-weighted studies. Within the 30.5 years reviewed, 53.4% of papers were published between 1982 and 1987. Overall, many papers called for a reduction in human resources, a message that dominated HRP during the 1980s, or noted an increase in the demand for services. HRP publications often had questionable strength or analytic frameworks. The paradigm of busyness capacity evolved from a belief around an economic model for the profession into a fundamental tenet of HRP. A formal analysis to establish its existence beyond arbitrary dentist to population ratios has usually been lacking. (Maupomé Gerardo; Hann Jack; Jeannine M. Ray.2001)

We will go through some studies which are documented in the developed countries; we will start with few studies in The United State of America, it worth to note that the studies/models described here took a generally more complex and sophisticated approach in modeling supply and demand of dental personnel. It is apparent that these study teams had access to rich data sources. Such workforce planning exercises are also conducted in more frequent intervals in those countries:

Dental workforce planning studies/models developed in the United States:

The Dental Requirements Model (DRM): (Byck, 2001). This needs-based model was developed to estimate the dentist requirements for meeting dental care needs of children enrolled in State Children's Health Insurance Programs (SCHIP). Population based estimates of dental caries and tooth surfaces to be filled obtained from NHANES III (1988-1994) were used to create a spreadsheet based tool for deriving dentist requirements. Routine checkup care and restorative care needs can be calculated using this model for up

to 80 categories of children based on race, ethnicity, age, and income. The main output of the model is the number of full time equivalent (FTE) general and pediatric dentists. The DRM is capable of modeling compensation for cost of services provided and the user can manipulate ten fields including estimates of dental payment and cost. Dentist productivity, proportion of children treated, and dental care levels can also be manipulated by the user. The model, however, does not take the productivity of the entire dental team into account. The model design also limits the number of children receiving care and the treatment provided (only oral exam and filling a portion of existing decayed teeth/surfaces).

As with any model based on national estimates, another potential limitation of the model is that the available state-specific data may not match the age/income/race-ethnicity categories used in the model. The model also does not recognize the limited availability of dentists willing to treat CHIP/Medicaid children, and the distribution of pediatric and general dentists used in the model may not be realistic for many states and counties. Applying the model at state level does not allow one to account for the actual location of the dentists and hence to accurately predict dentist requirements in specific areas.

Wisconsin dental workforce study: (Beazoglou, 2002) In 2000, amid growing concerns among dentists, state legislators, and concerned citizens "about the adequacy of long-term supply of dental services in Wisconsin", the Wisconsin Dental Association contracted a research organization to assess the current supply and demand for dental services in the state, determine the expected demand for services and number of dentists needed over the next ten years, and assess the impact of different strategies for increasing the supply of dental services.

The researchers took a market-based approach in developing the analytic models. Economic factors that indicate that dentists would choose locating practices rather than a professional assessment of the actual dental services need of the area were used as bases for the models. Factors like population size, average county income, percent of population that is Medicaid eligible, percent of population with fluoride deficient water, dental morbidity (DMFS), provider characteristics (age and sex), and office rental and other

practice costs were the key determinants in assessing the adequacy of the number of dentists practicing in each of the 72 counties in Wisconsin. The same set of factors was also used in predicting future need of dental services and the number of dentists in the state.

The findings suggested a significant mal distribution of dentists in the state — almost half of the Wisconsin dentists were located in the four largest counties of the state. The models also predicted a 10 percent decline in the overall number of dentists in Wisconsin by 2010 due to the disparity between the numbers entering and leaving practice.

The increased productivity of dentists is likely to offset some increase in demand due to increase in population size and per capita utilization of dental services, the models predicted a statewide shortage of 194 dentists to merely maintain the current (2000) level of service availability.

The major limitations of the models were lack of precise data and the inability to account for potential changes in the larger economic and social environments.

The best available data at times were national or regional data since state/county level data on certain factors were not available; for example, practice characteristics data were not available for Wisconsin and the researchers used national estimates in their model. The researchers also stated, "We believe the current study would be significantly enhanced if it were supplemented (i) by a professional assessment of current oral health needs within the Wisconsin population, and (ii) by additional information regarding the current adequacy of access to, and availability of, dental services" (p. 3).

A study conducted in Victoria (Australia) on oral health services workforce plan (Department of Human Services, 2002). The Australian Institute of Health and Welfare's Dental Statistics and Research Unit carried out this project under contract from the

Victorian Department of Human Services to prepare 10-year projections of supply and demand of dental personnel in Victoria. Projections were prepared for dentists, dental therapists, dental hygienists, prosthetics, and dental assistants in both public and private sectors. The project also identified and made recommendations on factors that have an impact on recruitment and retention of public sector oral health personnel. The analyses and projections were based on labor force data, survey of dentists, survey of State/Territory dental directors, and panel discussions of dentists, dental students, dental therapists and dental assistants.

DeFriese et al (1982) model of supply and requirement of dental services was used as the theoretical basis for the projections, (DeFriese & Barker, 1982). The supply of oral health workforce was regarded as a dynamic system of stocks (number of registered and/or practicing dentists, hygienists, therapists, prosthetics, and dental assistants in the base year 1998) and flows (recruitment to the workforce through education and migration, and attrition due to out-migration, retirement, and career changes). Workforce supply was projected across 1998 to 2010 using a Markov chain model. Separate models were specified for male and female dentists, and for dental hygienists, therapists, and prosthetics. Projections of the numbers of dental assistants were based on employment ratios against all other oral health personnel. In 1998 there were 2,397 registered and 2,017 practicing dentists in Victoria. With the vast majority of dentists working in the private sector and in general practice, the 1998 base capacity of dentists was estimated to be 5.446 million visits annually. Depending on the recruitment rate used in the model, this capacity was projected to grow to between 5.454 and 5.878 million visits in 2010—increases of 0.1 to 7.9 percent. There were 58 registered and 49 practicing dental hygienists and the number was projected to grow to between 90 and 163 in 2010. The number of dental hygienists may seem surprisingly low to a U.S. reader; however, there were 227 registered dental therapists in 1997 and the number was projected to be between 224 and 271 in 2010. There were also 237 practicing dental 17 prosthetics that provided approximately 237,000 visits in 1998. Due to the lack of data on recruitment and attrition, the number of FTE dental assistants needed in 2010 was estimated on the basis of employment trends in relation to other dental professionals and was estimated to be between 3,882 and 3,917; there were 3,634 FTE dental assistants in 1998. Altogether, the supply capacity of the dental health workforce in Victoria in 1998 was 6.058 million dental visits. Depending on the level of

recruitment assumption (low, medium, or high), the capacity was projected to remain unchanged (6.058 million visits for low recruitment vectors), increase by 5.6 percent (6.397 million visits for medium recruitment vectors), or increase by 11.2 percent (6.735 million visits for high recruitment vectors) from 1998 to 2010.

A demand-based approach was taken in determining the requirement for dental services. The demand for dental services was estimated and projected on the basis of 10 age specific population estimates and dentate and edentulous subgroups within each population group. Past trends in utilization/demand were extrapolated forward to 2010 under a range of varying assumptions about the continuation of trends to determine the projected demand. With the Victorian population projected to grow by 7.7 percent from 4.647 million in 1998 to 5.007 million in 2010, under varying assumptions for continuation of time trends in demand, the 1998 demand for dental visits was estimated to be between 6.172 and 6.539 million visits and was projected to grow to between 6.861 and 8.993 million visits in 2010.

Reconciliation of the supply and demand projections predicted a shortage of dental personnel in 2010 under the most likely conditions; only the high projections of growth in supply of dental personnel would be able to meet a very modest growth in demand for dental services. To close the gap between projected demand for services and capacity of oral health services under medium growth assumptions, Victoria would need an additional 524 dentists, 14 hygienists, 28 therapists and 61 Prosthetics over 1998 numbers (keeping the proportions of providers at 1998 Level).

The report pointed out that because of factors such as the time required to expand dentist education and uncertainty about choice of location by new dentists, attempts to increase the number of dentists trained would not have significant 18 impacts on the supply situation. Attempts to increase dentists' productivity would also have only limited impact. Recruitment of other dental professionals with shorter training times was recommended as a more viable solution, provided that some issues related to practice/employment conditions of these professionals were addressed to maximize their productivity. The authors also cautioned about some of the major implications of dental workforce shortages on the dental care market: i) increase in dental care costs and less access to care for low-income groups; ii) wider wage gap between private and public sector dentists; iii) diminished capacity of public sector dental services; and iv) difficulty in recruiting dental personnel for the public sector.

Primary care dental workforce review (England); (Department of Health, 2004). This review of the dental workforce in England focused on dentists and professionals complementary to dentistry (PCDs) delivering primary dental care services both within the National Health Services and the private sector. The U.K. Department of Health conducted this review under the guidance of "internal and external reference groups drawn from all main stakeholders in dental care". The stakeholders included regulating bodies, professional associations, educational and training institutions, and service delivery agencies. Detailed models of demand and supply of dental workforce were developed to subsequently create future projections of the same, expressed in terms of 'clinical time'. Clinical time was defined as the direct contact time between a patient and a dental professional. The general approaches taken in supply and demand modeling are depicted in Figure (2.1).

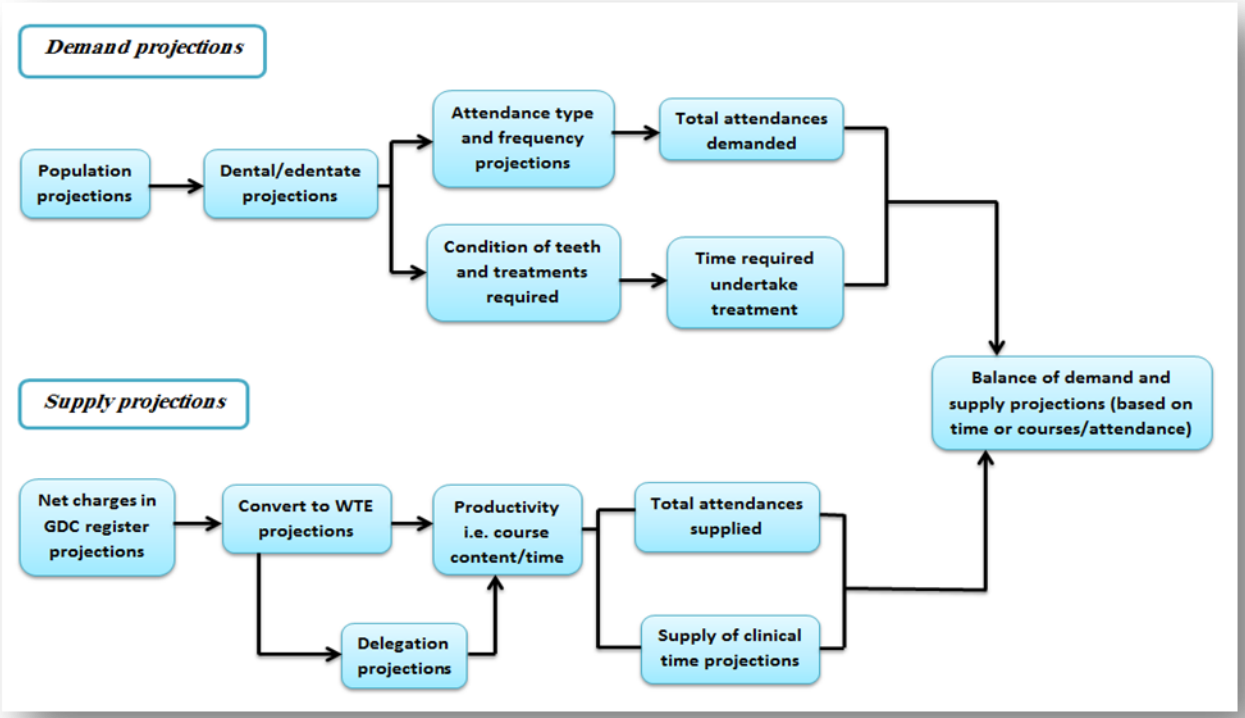

Figure (2.1): General approach to supply and demand modeling.

Separate models for adults and children demands for dental care services were developed based on population projections for the next 20 years. The main factors that determined demand projections included the demographic and oral health trends, dental visit patterns in the population, mix of treatments provided to patients, and time needed to provide those services. A group comprising of practitioners and a scientific adviser estimated clinical time/treatment hours. Projections of adult demand suggested a slight increase between 2001 and 2011 and then gradually leveling off between 2011 and 2021; the demand for child dental care services was predicted to remain unchanged in the same 20-year period.

The total demand at the time of the report was estimated to be 30 million clinical hours per year and was projected to grow to between 31 and 33 million clinical hours by 2021.

Supply models were based on registration (licensure) data for dentists, dental therapists, and dental hygienists. Dental technicians and dental nurses were not included in the workforce supply models. The models accounted for the age, sex, qualifications, patterns of working hours, career breaks, and numbers of entry/retirements for the professions included. The modeling process also took into account the changing policy context of increased local control in providing dental care and increased emphasis on development of dental teams. The number of practicing dentists was projected to decline between 2001 and 2021, whereas the numbers of practicing dental therapists and dental hygienists were projected to increase. Assessment of the supply and demand situations pointed to a nine percent undersupply of dental time/capacity in 2001 and was projected to increase to between 16 and 21 percent by 2011 and between 20 and 27 percent by 2021.

Reviewing the available literature reveals that there are no such studies conducted in Jenin or Palestine in general even studies in Arab World are newly conducted in this field, although it has been well documented in other countries. In order to develop comprehensive dental workforce planning models that address overall dental care needs of the entire population there needs to be more consistent and ongoing data collection efforts and attention to overall productivity of the dental delivery system in the Arab World.

Chapter Three

Conceptual Framework

3.1 Introduction

The planning of health human resources in general and in specific in dentistry is a difficult task (Maupomé, 2001). It is difficult because of the amount of the involved variables and elements that interoperate in a complex system. This complexity is produced not only because of the purely methodological difficulties for a scientific approach to this subject, but also for the political load which entails. The confluence and often confrontation of interests from the several bodies and institutions implied in the planning of human resources in dentistry makes it difficult to consider it as a conceptual and methodologically neutral exercise. Ministry of Health is worried for the continuous increase of the sanitary expense and will favor measures to limit health care expenditures; professional unions and organizations watch over the maintenance of the economic and social status of their members seeking to increase their members' market power, employment and income; consumers ask for an improvement in the accessibility to dental services (specially about their costs) while educators and providers of human resources are worried about improving and increasing their offer. Unfortunately, quite often we forget that planning of human resources, by itself alone, it's not a purpose but an instrument to achieve the health objectives previously established.

The basic question of this study that's to be raised "is there a need or enough demand for dental health services in Jenin?" instead of just a simple "Are there too many (or few) dentists in Jenin?" To better understand the answer to this question it implies a knowledge, among others of factors affecting health workforce imbalances like: population demography, professional demography, epidemiology of the more prevalent oral diseases, oral healthcare needs and demands, acquired and future professional competences, technological innovations and its impact in the professional practice, provision and funding of dental services, organizational models and its future trends as well as health policies and the role of the organized profession in its design.

Planning of human resources in dentistry brings up some problems that affect its realization:

A. There is no agreement in relation to the ideal number of dentists to cover the needs of a determinate population. As a matter of fact, there is not even an agreement in the way of calculating this ideal proportion. Often the proportion of working dentists (not just graduated) for inhabitant is the only ratio available even though this figure does not give, as an example, any information regarding the quality of the professionals because when there is a shortage of workers even those professionals without a proper training fill in working vacancies because there is a need to recruit professionals. It neither gives us information related to the number of working hours nor the services developed during their working time so it is difficult to gauge a standard of equivalent productivity for a set of suppliers of oral health services.

B. It is easier to measure the labor offer than the needs and demands for dental services. There is still no ideal form of quantifying the real needs of a population from the epidemiological studies, neither translating these needs into expressed demand for dental services.

C. The projection in the offer of oral health services is confused by factors such as the creation of new dental schools, the migration of dental professionals or the imprecision in the professional competence of intermediate dental professionals such as dental laboratories' or dental auxiliaries all of which impede the proper prospective measurement of the dentist/inhabitant ratios (Casals E, Cuenca E, 2005).

The used methodology and therefore the design of this study brought up as an answer to the question: "Is there a sufficient demand to absorb an increase in the number of professionals?" The capacity to intervene in the system according to this approach is based on possibility of regulating the offer of dentists. A great number of planning studies focus in such concept which some authors name "the paradigm of lack of work", according to the belief that as long as the number of dentists is slightly inferior to the demand which the market can bear, the businesses will be good for the profession (Chen M, et al 1997).

Planning of human resources in dentistry should be understood as one item in a complex system, where several components interact with the purpose to achieve a final goal: the improvement of the oral health of the population. Limiting a study of human resources' planning to a simple study of future demographic trends would avoid the core of the

question, which it is no other than an answer to the question: Are the disposable human resources the suitable ones –in quality and quantity –to give a satisfactory attention to the needs and demands in oral health of the Jenin population?

Often the number of dentists is perceived as an important condition to the provision of oral health services, so that the availability of dentists would correlate with a better level of oral health of a given population. This hypothesis was considered by WHO (Chen M, et al, 1997), in a very rigorous study, which analyzed the impact that several systems had in the levels of oral health in eight different countries. According to (Chen M, et al, 1997), his study analyzed how availability, accessibility and acceptance of dental systems influenced on the dental health of the studied populations. The study summarizes that "differences observed in the levels of oral health and non-covered needs of treatment were not associated with the limitations in the number and distribution of dentists, but maybe with other factors which influenced the system". Therefore the hypothesis initially brought up, which suggested that an increase in the number of dentists would be translated into an improvement of the oral health status and a decrease of treatment needs, was not corroborated by the data obtained in the study.

3.2 Stakeholders in dental workforce planning

There are many stakeholders who intersect and influence the dental delivery system. The main effective stakeholders in dental delivery system in Jenin district include the followings:

- The Palestinian Ministry of Health which has a great role in arranging and controlling dental market. However, this role has been weakened by the current political situation and other opponents such as: PDA, population, students. We may argue that the government should have a more powerful rule in developing a strategy that balance dentists workforce with the accepted level of clients' demands and needs.

- The Palestinian Dental Association (PDA) which plays an important role in regulating the dental market services through forcing its members to follow the accepted guidelines for fair dental practice considered an important stakeholder that

assumes to influence the dental delivery system in effective ways. However, the PDA has weak influence on regulating the dental practice environments.

- Dentists are the main providers for dental services. The quality and quantity of delivered services are in line with dentists professionally and efficiency. Unfortunately dentists' investment in establishing their own clinics might not be sufficient enough to make it worthy and as a consequence of this, dentists are not always able to follow the fast-growing market of dental technologies in dental market faced with insufficient returned cash from investment in delivering dental care, this would decrease the ability of dentists to increase their quality and quantity of delivered services by using last technology, dental assistant, hygienist, dental auxiliary.

- Dental faculties which are considered the main suppliers of dentists, play an important role in this issue and must be considered upon planning for dentists' workforce as they greatly influences dentists' numbers. In the West Bank, two dental schools exist: the Arab American University in Jenin (AAUJ) and Al Quds University in Abu Dees. Currently the two universities are investing more in their infrastructure to accommodate the growing demand from newly graduated students to study dentistry, the demand on this profession encouraged by social interpretation of this profession.

- The population who presents the needs and demands for the dental services must be taken into consideration when planning for dental services simply because it is the stakeholder that will pay for these services, so dental services supply must be in line with population needs, demand and utilization power for these services.

3.3 Study conceptual framework

Figure (3.1) represents the conceptual framework of the study, which explores the balance between population demand for dental services and dentists' supply who deliver these services.

On the first hand, to study the supply status of dentists, the conceptual frame work explored dentists' number by referring to PDA records, taking into consideration the main

sources of dentists supply; are they qualified from inside or outside of West Bank? Recognizing these sources would help controlling these sources of dentists supply. This side of the study had been supported by dentists' opinions about if there is oversupply of dentists serving in market or not. Forecasting dentists supply till 2015 would be estimated using regression line analysis; all of these data compared with the estimated dentists supply requirements depending on two approaches:

Population to dentist ratio:

The traditional dentist to population ratio method was used. The selected ratio was 1:5,000 which was recommended by the World Health Organization in 1985 (Joint WHO/FDI Working Group, 1989).

The population in the target year was obtained from (PCBS, 2008; Dalen Kristin & Pedersen Jon, 2004). The dentists' requirement in the target year was then calculated from this ratio.

Oral needs/ service approach:

The calculation of dental health personnel requirement in this method was based on the needs for services. The prevalence of dental diseases in view of data available on oral health needs, which include only children in school and children less than 12 years old which was previously obtained from (Sabha, 2007). The duties of dentists will include controlling caries disease; caries is largely a disease of childhood: intervention on early caries lesion is therefore economical and has long term benefit. Good oral hygiene practice introduced in an early age, and checked regularly, will results in an adults population with good oral health. The prevalence of the diseases was converted to service needs, and the service needs were further converted to needed time to deliver these services, according to this, dentists requirements needed to complete the task was calculated.

On the second hand, to measure the demand for dental services we used a survey for practicing dentists in Jenin private sector to measure productivity of dentists and to size the demand for their services, this side of the study had been supported also with dentists' opinions about if there is a proper demand to absorb increasing dentists offers.

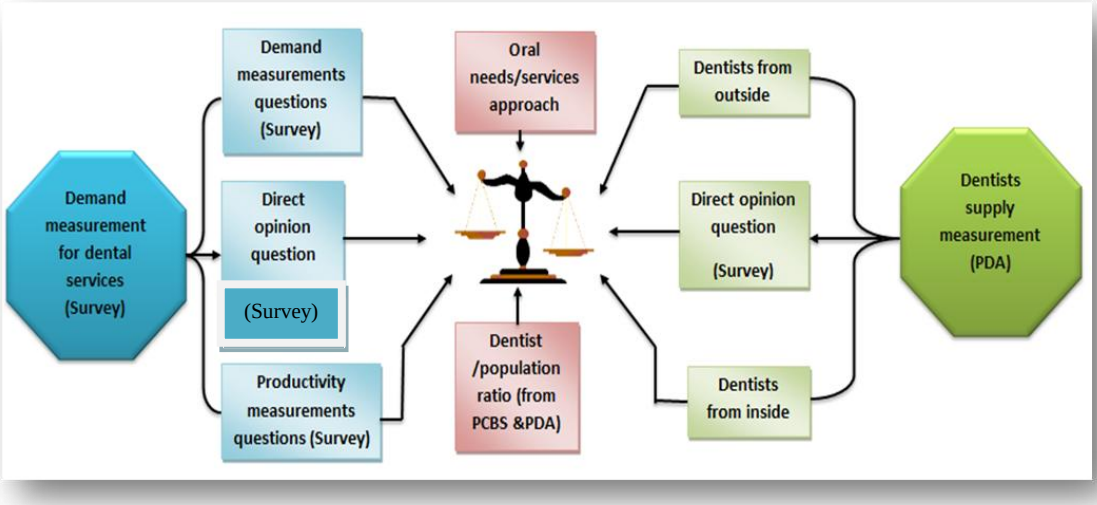

Figure (3.1): The study conceptual framework.

3.4 Variables interaction between supply and demand for dental services

The number of dentists needed to correctly cover the needs of the population, requires an analysis of very diverse variables which shape a system with two main forces: the production offer of dental services (supply side) in one hand and the requirements of dental services (demand side) in the other hand, according to the model adapted from that proposed by Defriese and Baker (DeFriese G, 1983). The model, presented in Figure (3.2), begins at the periphery with counting the dental workforce and the population and endeavors to work towards common units to quantify both the capacity to supply dental services and the demand for dental services. The model illustrates:

- The complexity of the supply side introduced by multiple levels of qualification among personnel and the consequent mixing within individual dental practices or clinics of personnel to produce the services supplied.
- The complexity of the demand side of reconciling the interaction between oral health status, needs and demand for dental services.

- The interface between supply and demand, where decisions on the appropriateness of the balance reflect social, economic and political interests and drive policy directions (Dana N Teusner, 2008).

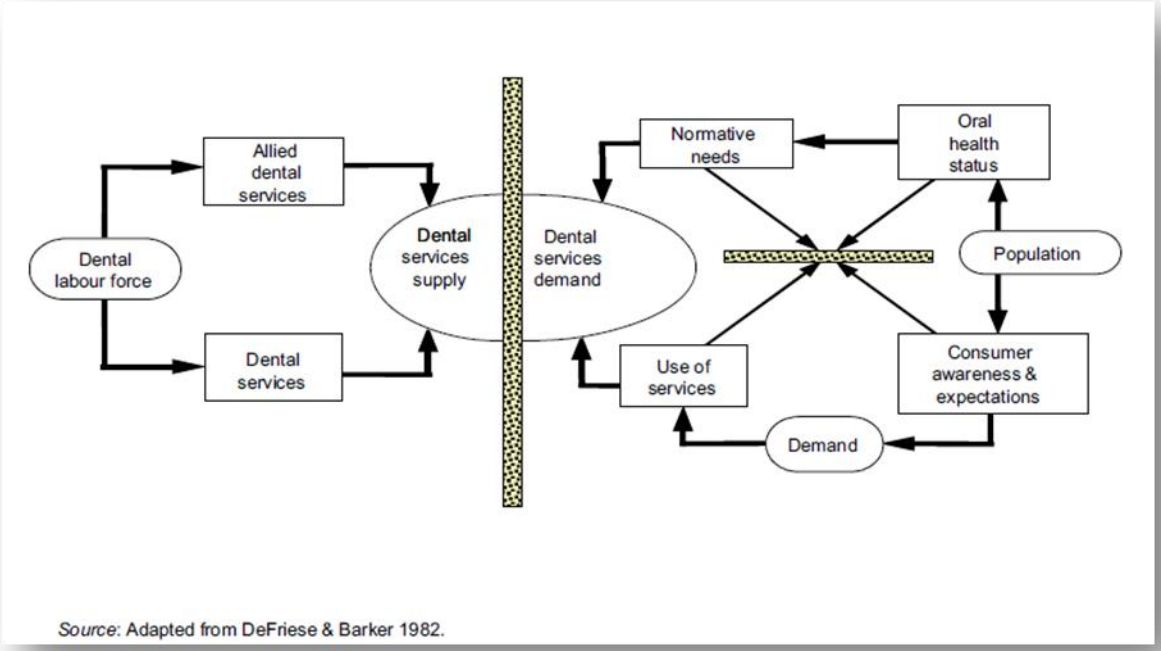

Figure (3.2): Relationship between supply and demand for dental services.

The set of elements that interacts in these systems are dynamic and changing, and it is necessary to identify suitably the most relevant engines of change, with the purpose of evaluating its possible future impact in the evolution of this system.

3.5 Variables of supply and demand in dental services

We can classify the major factors and variables affecting the demand and supply for dental services according to their strongest relation to each one of the two main forces (even though they will also have an impact on the other force): a first one which is the production offer of dentists and a second one related to the requirement for dental services.

3.5.1 Variables affecting the supply side (production) in dental services:

Professional demography

The analysis of the professional demography not only entails the evolution of the number of dentists registered in the Palestinian Dental Association, but also other qualitative variables that could affect the activity of the system in the future. Therefore it is important to study some variables related with professional demography such as: number, age, gender, qualification, immigration flows and demographic projections.

Dentists' number

When we speak about professional offer, we refer to the collective constituted by active professionals, but often we also refer to the future flow of new graduates from local schools into the labor market as well as the contemporary trend of foreign graduates which try to enter the market. Since 2000 a continuous increase in the number of dentists can be clearly observed in Jenin District. This trend complemented with the existing demand to access the profession which still enjoys the social perception of an opportunity career.

The dentists with foreign certificates in the last two decades represented a rejuvenation of the average age of dentists in the West Bank as well as in Jenin. Moreover, the number of these graduates (usually 23 year-old) is nowadays higher than before so the introduction of dental faculties had an important effect on the evolution of the average dentists' age which shows a light trend of rejuvenation.

Increased in dentists number often entails an increase of induced demand -overtreatment- and fractures the pact between patient and dentist based on confidence with negative and severe consequences for the profession as well as for the patients. The uncontrolled growth of dentists might provoke an increase of the induced demand with dangerous consequences as the already studied medium life of a filling: "it diminishes when the income of the dentists diminishes".

Dentists Gender

The incorporation of women into the dental profession is one of the most outstanding changes in the labor market and is a common trend to many other professions with minor work availability for reasons of pregnancy and of maternity.

Dentists Qualification

Palestine has been capable of integrating new human resources in a very positive way. Dentists who apply for licensing and accreditation have to spend one year training, serving in public clinics. After this dentists who hold foreign certificate must pass MoH accreditation exam.

Demographic projections

There seems to be an absence of planning of dental human resources in a very clear way, justifying the opening of new dental schools with the fact that there is a potential demand from students that has not been reduced. In a country like Palestine, paradigm of a free market economy, the flow of students to dental schools follows some parameters related with economic changes (the number of graduates from 2000 starting to increase until today).

Although being a free market country, the government has a very important capacity of intervention with regulatory mechanisms regarding the training of human resources - Universities- as well as the provision of healthcare services.

Immigration flows

The trends in the immigration flows are difficult to foresee, since they are influenced by sudden changes. The political and economic situation, severely deteriorated in Palestine, foresees a continued flow of dentists towards neighboring Arab country.

Productivity of professionals

The provision of dental services is often associated with the number of professionals in exercise in one area, even though the dentist/inhabitant ratio is an interesting raw figure for comparison. Some variables affect it in a decisive way such as the productivity of dentists. Therefore the provision of services depends not only on the number of dentists, but also on their productivity level. It is a demonstrated fact that increasing the healthcare offer provokes an increase in the demand for services, with some limits influenced among others by economic factors. The productivity of the dentists is influenced by very diverse factors related with the characteristics of the supplier, such as: age, gender, sanitary model (public versus private) or the type of practice (auxiliary staff and cabinets) among others.

The results of several studies about productivity differ according to the used methodology. In general they tend to measure technical efficiency regarding the dentist (costs/savings) rather than oral health goals achievement for the patient.

3.5.2 Variables which affect the demand side in dental services:

Population demography

According to Palestinian Central Bureau of the Census (PCBS), the Jenin population at the middle of 2010 was 274,001 inhabitants, out of them there were 139,193 males and 134,808 females. The (PCBS) reported 6,969 new born till 2009, and indicated an increasing life expectancy 70.2-72.9 for male and female respectively in 2009 (PCBS, 2010).

Epidemiology of oral diseases

Diseases like tooth decay and the treatment of which has been during many years the main occupation of the dentists, has had a very important slope in Jenin. A brief critical analysis of the results of several epidemiological studies in Jenin shows critical declination of DMFT factor (Kateeb.E, 2007).

Expressed demand for dental services

The analysis of the needs for dental treatment in a population and its translation into demand for dental services is one of the most complex questions to solve. The evaluation of treatment needs is made through epidemiological surveys but it is necessary to take into account that the results for treatment needs of an epidemiological study are more conservative than the treatment needs obtained in a dental practice, due to the use of more conservative, objective and consistent diagnostic criteria. In the other hand, the process which turns treatment needs, detected by the experts, into treatment demand, expressed by patients, is complex and influenced by different variables like availability, accessibility and acceptance. Moreover, it is conditioned by factors like: gender, educational and socioeconomic level, health knowledge or occupation.

From a general point of view, when we analyze demand and utilization of oral health services, it is necessary to take into account that these services do not follow habitual

market laws, in which supplier and consumer have similar information. In dental services, as well as in medical services in general, the information is asymmetrical (the supplier has much more information than the patient) so the supplier operates as an agent determining often the needs of the consumer and so influencing in a direct way on the demands for dental services. In this context, the situation of induced demand could be very frequent. The induced demand is above the demand which the patient would be willing to accept in the case that he had full information or at least the same information than the dentist.
The analysis of the factors which are related with the practice of induced demand which can lead to over treatment or unnecessary treatments are also complex. Most studies cite the increase in suppliers' offer -dentists- like one of the elements identified as responsible for over treatment, in order to sustain the level of dentists' income in a competitive labor market. This situation might not have a negative impact if it stressed on non-covered needs of the population, but often, this could entail over treatment (treatment not needed and, therefore, iatrogenic) depending on the self-regulation of the profession and its ethical standards.

One of the key elements when analyzing the barriers that hamper or condition the process of translating the needs in oral health of the population into expressed demand for treatment is the type of funding. The expense in oral health is a very important part in the sanitary expense.

As a higher educational level is often related to a higher income level, those different dental attendance' behaviors related to the educational level could have a real relation to income. Income level is the most determinant variable related to dental attendance and it has an effect at all income levels. Even though those differences are not so important comparing each income subgroup, there is always a higher probability of visiting a dentist at a higher income group which only fails for the income group (Casals E, Cuenca E, 2005).

The model used to assess demand of population of dental services, dentists productivity and dentists supply and estimation are explained in the results chapter.

Chapter Four

Study Methodology

4.1 Introduction

This study focuses on assessing the current demand and supply for dental services in Jenin district and to project the future supply of dentists by 2015. In this chapter the research methodology was presented. The population size, study design and tools of the study, data collection procedure and piloting were described. Moreover, it illustrates validity and reliability of the instrument that constructed and used for the purpose of data collection. The methods of data analysis and ethical matters were also included in this study.

4.2 Study context

The study was conducted in Jenin District which lies in the northern part of the West Bank, in the central part of Palestine (Jenin map, see annex (6)). Jenin District extent is about one million denims and consists of 13 municipalities, 68 local councils (Ministry of Interior, 2008).

The population of Jenin District was about 256,619 inhabitants (PCBS, 2007). Approximately 4% of the population (10,176 persons) lives in Jenin camp. Sex ratio is one male to 1.03 female. The district has relatively very young population with 40.0% of the population; about 100,701 persons are less than 14 years old (PCBS, 2007). Jenin is an agricultural district with over 580,000 denims of fertile and high quality soil that produce considerable harvests. The agricultural sector of Jenin district accounts for 30% of the Palestinian national income, and supplies work for 25% of the Palestinian farmer population (Ministry of Interior, 2008).

4.3 Study population

The study population consists of the registered self-employed dentists working in the private sector in Jenin district. According to the PDA records there are 165 registered dentists in Jenin district in 2010. This number represents 11% of the dentists serving in the West Bank, see Figure (1.4).

This study targeted all the active dentists working in private dental clinics or centers.

Out of the registered 165 dentists in PDA, we excluded the inactive ones after counting the outflow. Figure (4.1) shows the inflow and the outflow of actively working dentists in Jenin dental labor market. 50 dentists out of the 165 have ceased practice for different reasons (Fig.4.1); wastage due to attrition rate in 5 year periods (due to death retirements or altering the career) was 5 dentists which represent 3% of attrition rate, 40 dentists were immigrants out of Jenin and 5 dentists were in study leave. We targeted all the remaining 115 dentists in Jenin district.

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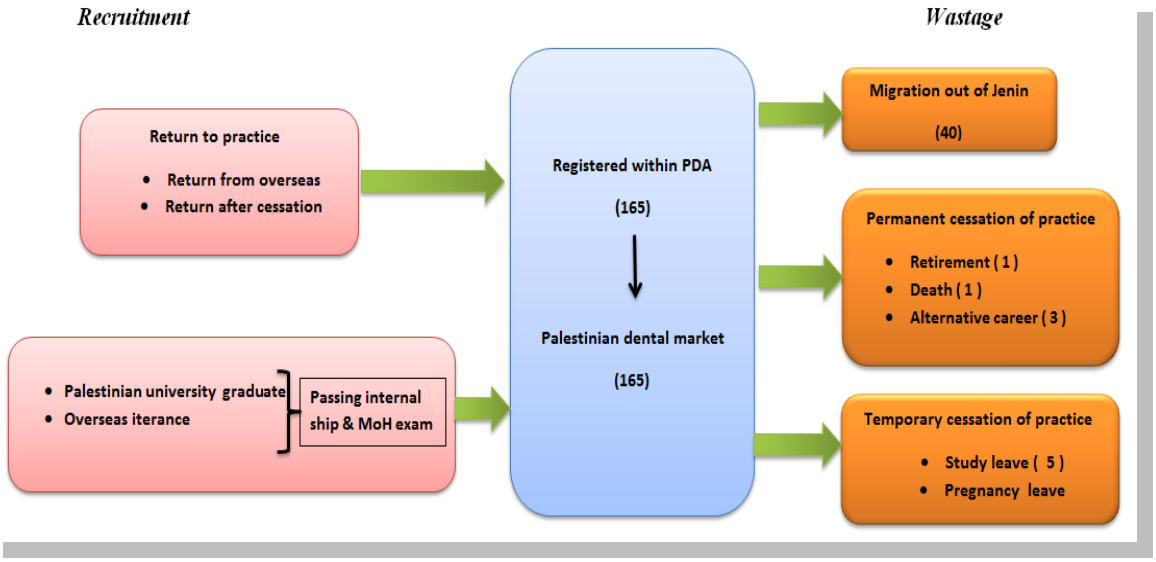

Figure (4.1): Dentists workforce inflow and outflow.

4.4 Study design

A cross sectional design was utilized to achieve the objectives of the study. Active self-employed dentists in Jenin were targeted by a self-administered questionnaire, which was used to measure patients' demands and attitudes towards dental care and to explore dentists' opinions (Annex 1, 2). In addition to that, secondary data analyses were conducted. These included data about the dentists' supply, prevalence of DMFT factor, and demographic information collected from three mains sources:

- Palestinian Dental Association (PDA).
- Palestinian Ministry of Health (MoH).
- Palestinian Central Bureau of the Census (PCBS).

4.5 Study tools

Tools used in this study were divided into two types; first one was used to evaluate the demand and productivity trends in dentistry, the second type used to assess dentists supply, it consists of three parts:

- Evaluation of current dentists' number.
- Projecting the future dentists' number till 2015.
- Estimating actual needed dentists' number using two different approaches.

4.5.1 Assessment of the demand and productivity for dental care:

The tool which was used to measure the demand for dental care and productivity of dentists was a self-administered questionnaire. The questionnaire was developed by the researcher with respect to available literature to serve the study objectives and conceptual

framework. The questionnaires were written in Arabic language to be easily understood by providers. The questionnaire included different sections: it include questions about demand for dental services, questions about productivity of the dentists, and direct opinions questions to the dentists, in addition to open questions. These sections covered in the questionnaire (Annex 1, 2) as following:

Section 1: explored demand trends from different prospects, it included the following questions:

- Question number (2): measured the average number of patients' visits to dentists clinic in one week, as a measure for size of demand for dental services.
- Question number (8): measured busyness index for dentists, which represents important measures for demand and ability of dentists to meet this demand.
- Question number (9): assessed the average of patient spending on dental treatment in one year. This measure will help us to size the economical demand for our population.
- Question number (10): evaluated dentists' opinions on patients' expenditure on dental care in one year.
- Question number (11): evaluated dentists' net monthly income.
- Question number (16): assessed the gender of those utilizes more dental care.
- Question number (14): assessed the place where most of patients come from.
- Question number (15): assessed the age groups of those mostly utilizing the dental care services at the clinics.
- Question number (12): assessed the most frequent type of delivered treatments at the dental clinics.
- Question number (17): assessed the motivation of dentists to continue their specialty in dentistry.

Section 2: Measured the dentists' productivity: in this part dentists productivity explored from different aspects. It includes the following questions:

- Question number (1): assessed productivity of dentists depending on their experience.
- Question number (5): dealt with measuring working time per day for dentists.
- Question number (6): dealt with measuring working days a week.
- Question number (7): dealt with measuring days dentists out of work on vacation.
- Question number (4): measured the ability of dentists to accept to treat more patients.
- Question number (18): measured the number of dental units dentists have.
- Question number (19): explored the availability of receptionist in dental clinic.
- Question number (20): explored the availability of dental assistance with dentists.
- Question number (21): explored the availability of x-ray device in dental clinic.
- Question number (22): explored the availability of dental laboratories attached to dental clinic.

Section 3: Direct opinion questions to dentists, it include the following questions:

- Question number (3): assessed dentists' opinion about average of patients visits.
- Question number (10): assessed dentists' opinions about the patients' expenditure on dental care.
- Question number (13): assessed dentists' opinions about patients' awareness to importance of dental treatments.
- Question number (23): assessed dentists' opinions about the state of dentists' oversupply, in addition to open questions to dentists about the causes and recommended solutions for this problem, if they think it is so.

4.5.2 Assessment of the current supply:

The second part of the study was to assess dentists' supply in Jenin district, it consists of three sections; evaluating current dentists number depending on data derived from Palestinian Dental Association (annual records; 2005, 2006, 2007, 2008, 2009, 2010, 2011). This data were used to assess trends on dentists' growth pattern.

Regression line analysis was used to project dentists' number in 2015.

Two approaches were used to estimate dentists' requirements:

- Dentists to population ratio approach.
- Oral needs/ service approach.

4.6 Validity and reliability of the study tools

After developing the questionnaire, piloting was conducted to test the questionnaire before used in actual data collection. Ten randomly selected dentists from Nablus districts were asked to fill in the questionnaire. The dentists were selected randomly and consent forms explaining the aims of the study were attached with the questionnaire.

The questionnaire was tested and validated to assure understanding; clarity of statements and meanings in presented questionnaire, special concerns was given to readability and comprehension of the questionnaire. Such verification process was made through the advisor who had research background; five experts from the Faculties of Dentistry in AAUJ, Al Quds University, Al Quds Open University, and the PDA Annex (5) were conducted for validation. The questionnaire was improved based on the comments received, which basically were on shaping the style of the questionnaire and adding few questions about who consume dental services more in specific questions number (14, 15, 16). In addition to that a question on dentist opinions on continuing dental education and specialty in dentistry was added (number 17).

Internal consistency was chosen to estimate the reliability of the questionnaire in this study. After collecting the information from pilot study it was correlated by using Cronbach's Alpha (Polgarr &Thomas, 1997). Cronbach's Alpha coefficient is one of the most common means of estimating internal consistency of items in a scale. Popularized in 1951 article by Cronbach Alpha measures the extent to which item responses at the same time correlate highly with each other. Commonly, an Alpha level of 0.7 or higher indicates acceptable reliability, and 0.8 or higher indicates good reliability. An Alpha level of 0.95 or higher is considered as indicating high reliability but is not necessarily desirable (Cronbach& Richard, 2004). In this study Cronbach's Alpha was calculated to assess the instrument's reliability (by using SPSS) and was to be 0.759.

4.7 Data collection

The primary data were collected between 25 August and 31 December 2010.

The researcher visited the dentists' clinics and explained for them the study objectives. In addition to that, two medical sale representatives (Mr. Badran Rawjbi and Mss. Rima Sawafta) who made regular visits to dentists' clinic were trained by the researcher to assist in data collection.

The secondary data were collected as the follows:

- Dentists' numbers in Jenin district for each year from 2005 till 2010, this data derived from PDA annual records.
- Population numbers and growth rate, these data derived from PCBS reports published on the Bureau’s web-site.
- Information about the prevalence of dental caries within school children, this data derived from MoH annual reports published on the MoH web-site.

4.8 Ethical considerations

Before beginning the study, letters were sent from Al-Quds University to PDA and to the Department of Oral Health of the MoH to explain the study purpose and to ask for an official permission to undertake the study and facilitate the researcher visits to the private dental clinics and to the MoH information center to collect the needed data. In addition to that, a consent form was prepared and attached to the questionnaire, in which of the

confidentiality in the treatment of collected data and impartiality in analysis of the data were attested.

4.9 Data analysis

The data were analyzed using Statistical Packages for Social Sciences (SPSS) version 16.

Date analyses were completed in four stages:

Stage (1): descriptive analysis for data was used, depending on frequencies, percentages, and medians to describe the data. To facilitate data interpretation and answering study questions, the results are presented in four sections:

- Section one presented participants characteristics.
- Section two measured the trends in demand for dental care.
- Section three dealt with measuring productivity trends.
- Section four dealt with direct opinion questions to dentists.

Stage (2): Cross tabbing analysis was used to explore relations between different variables.

Stage (3): Regression analysis (multivariate analysis) was used to determine the direction and the strength of the relationship between independent variables and dependent variables, to highlight the factors that affect the dependent variables in our study.

Stage (4): evaluated dentists' supply, divided in three sections:
Section 1: assessed current dentists supply by referring to PDA annual records from 2005 to 2010.

Section 2: future projection for dentists' number till 2015 using regression line analysis.

Section 3: estimating dentists' requirements using two approaches: Population to dentist ratio and oral needs/ service approach.

Chapter Five

Results and Analyses

5.1 Part one: descriptive analysis

5.1.1 Participants characteristics:

Ninety five dentists participated in this study out of the 115 active dentists approached in Jenin district. The response rate was 82.6%.Table (5.1) shows that, 82.1% of them are working in Jenin City, while 17.9% are working in villages. Of those, 57.9% live in the city while 42.1% live in villages. Both genders were represented in the study: 67.4% were males and 32.6% were females.

Considering the graduation place of dentists we found that: 30.3% (n= 20) dentists graduated from Palestine, 19.69% (n= 13) from Russia, 7.57% (n=5) from Ukraine,7.57% (n= 5) from Syria, 9.09% (n= 6) from Egypt, 6.06% (n= 4) from Jordan,4.54% (n= 3) from Iraq, 4.54% (n= 3) from Turkey, 3.03% (n= 2) from Kazakhstan and 1.51% (n= 1) from each of UAE, Yugoslavia, Malaysia, Romania and Greece (Table 5.1).

Table (5.1): General characteristics of the study participants

Variable name	Frequency	Percentage
Gender		
male	64	67.4%
female	31	32.6%
Working place		
Jenin city	78	82.1%
Villages	17	17.9%
Living place		
Jenin city	55	57.9%

villages	40	42.1%
Place of graduation		
Palestine	20	30.3%
Russia	13	19.69%
Ukraine	5	7.57%
Syria	5	7.57%
Egypt	6	9.09%
Jordan	4	6.06%
Iraq	3	4.54%
Turkey	3	4.54%
Kazakhstan	2	3.03%
UAE	1	1.51%
Yugoslavia	1	1.51%
Malaysia	1	1.51%
Romania	1	1.51%
Greece	1	1.51%

5.1.2 Demand for dental care:

This section presents the study results that deal with exploring trends in demand for dental services.

Question number two shows the size of demand to dental services, based on the replies of the dentists; we took the average number of patients' visits to dentist clinic in one week as a measure for quantity of demand. The median number of patient's visits to the dentist clinic was between 10-20 visits per week, which represents the responses of 43% of the participating dentist, 18% have (21-30) patients visit per week, 15% of participant dentists have less than ten patients per week, 14% of dentists have (31-40) visits per week, 7% of

participant has more than 50 patient's visits per week, 3% of dentists have (41-50) patient's visits per week, (Figure 5.1).

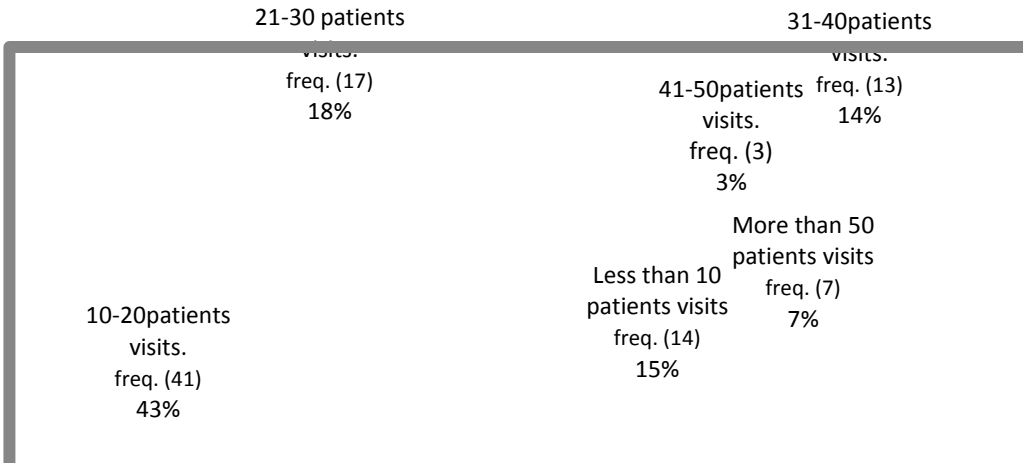

Figure (5.1): Average of weekly patient's visits to the dentists' clinics.

In relation to the above question, in question number three, participant dentists were asked about their opinion about the number of patients' visits per week, (Figure5.2). 59% indicated that the number of patients' visits per week as moderate 33% indicated that the number of patients' visits per week as low, 6% indicated as high, and 2% had no point view of that.

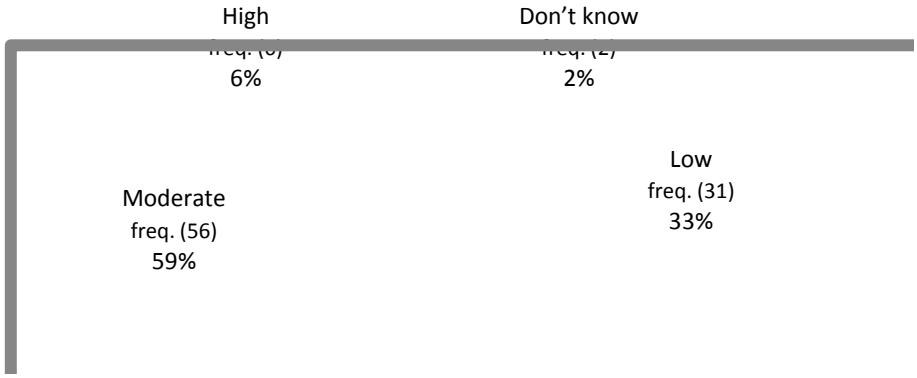

Figure (5.2): Opinion of dentists on number of patients visit to dental clinic per week.

Question number (8): about the busyness index (which represents important measure for demand and ability of dentists to meet this demand), the results in Figure (5.3) showed that 53% of participant dentists said that they were not busy and needed more patients, 39%

indicated that they had enough patients and can manage and accept more patients, 5% indicated that they were very busy and they could not accept more patients, 3% indicated that they could deliver care to all of their patients but could not manage more patients.

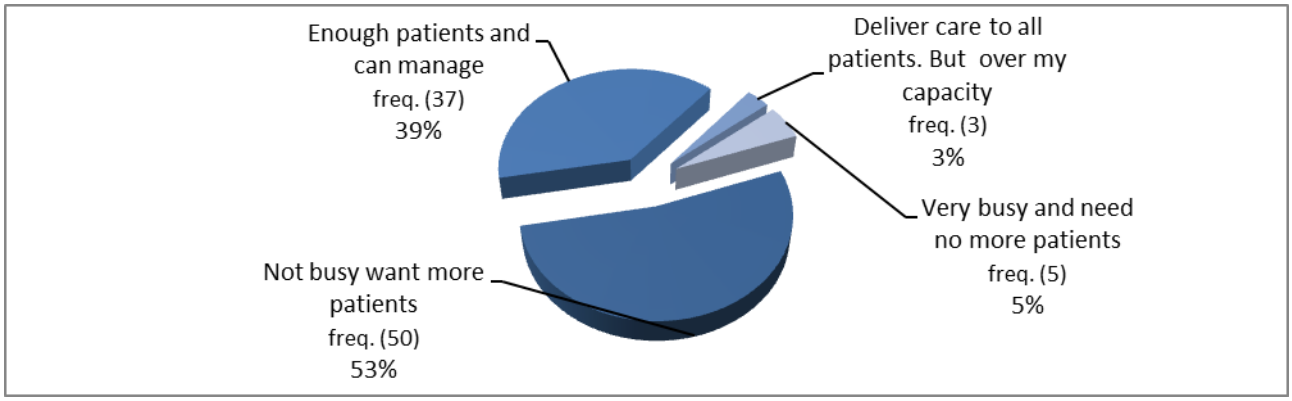

Figure (5.3): Dentists' busyness index.

In question number 9, dentists were asked about their opinions regarding the patients' average annual expenditure on dental care in Jenin district. This measure will help us to size the economical demand of the population in the district. According to the participant dentists, 57% of patients spend less than 500 NIS in average per year which also represented the median spending, 31% indicated spending (501-1000 NIS), 9% indicated (1001-1500NIS) and 3% of the participating dentists indicated (1501-2000 NIS) spending per year (Figure 5.4).

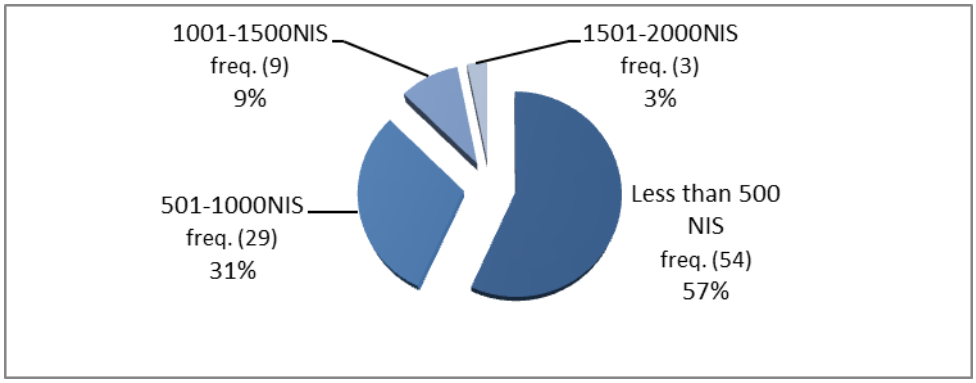

Figure (5.4): Patient's average expenditure on dental treatment in one year.

Linked to the patient average spending on dental care in answering question number 10, 46% of the participating dentists rated patients expenditures as moderate, 40% as low, 8% as good, 6% of participant didn't have an idea about the issue Figure (5.5).

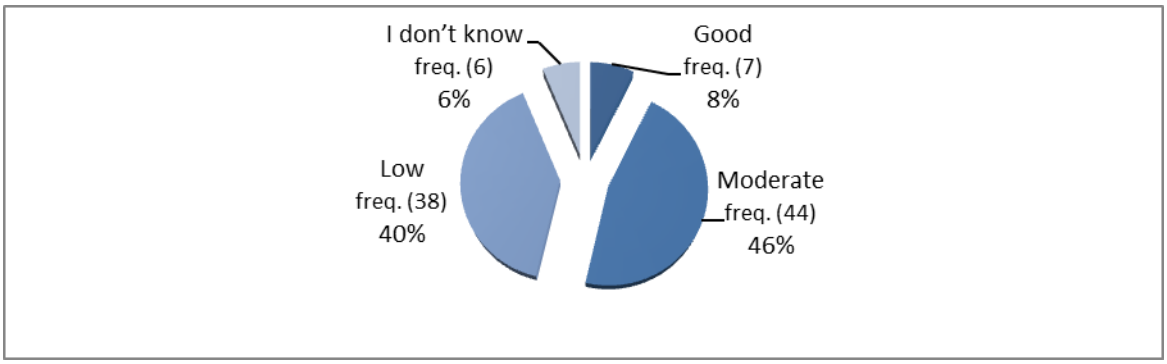

Figure (5.5): Dentist's opinions about patient's annual expenditure on dental care treatment.

In the question number (11), participants were asked about the net average of the monthly income they achieve from practicing dentistry. 36% of participants earn from 2,000 to 4,000 NIS per month and this represents the median income of the participants, 22% earn from 4,001 to 6,000 NIS, 21% earn less than 2,000 NIS, 12% earn from 6,001 to10, 000 NIS, 5% of dentists indicated that they earn more than 15,000 NIS per month, and 4% earn from 10,001 to15.000 NIS per month, Figure (5.6).

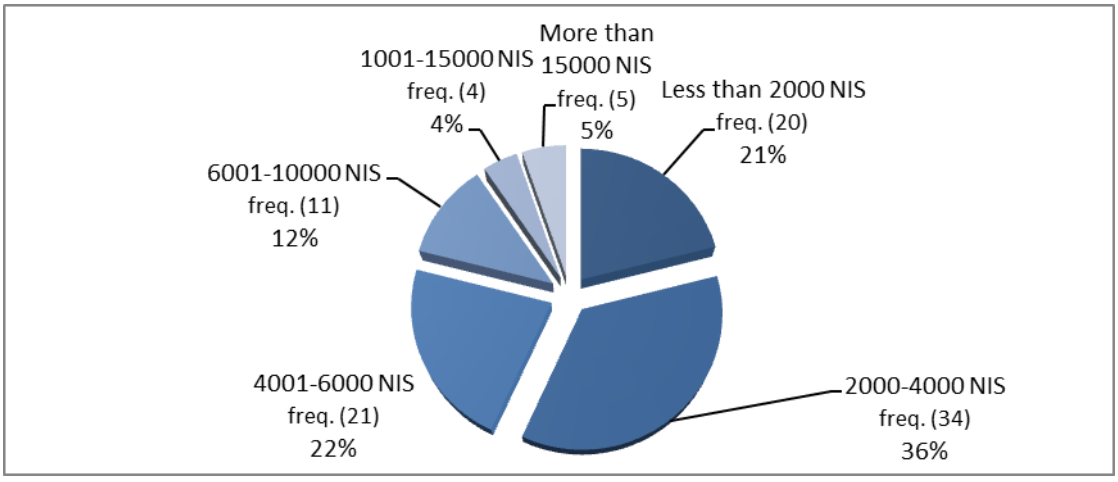

Figure (5.6): Total net monthly income of dental clinic.

In order to get an idea about the size of demand, it is important to know which group of population responsible for most frequent demand. Therefore, participants were asked about the gender, place of residence, age groups of their patients.

According to the 53% of the dentists most frequent patients were females, 43% of dentists indicated that they had equally presentation of genders among their most frequent patients and 4% indicated males as most frequent clients, Figure (5.7).

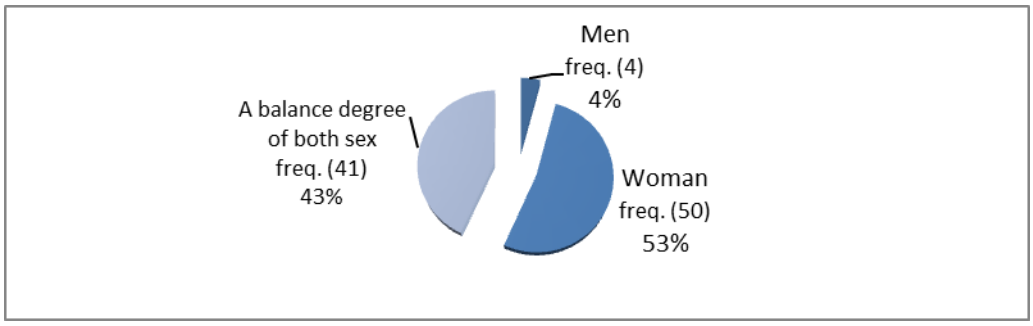

Figure (5.7): Gender of most of most frequent clients.

As for the place of residence of the patients (question 14), according to the dentists, 53% of the patients come from villages, 26% City residents, 15% of the patients come from inside 1948 areas, and 6% of dentists don't know from where their patients come (Figure5.8).

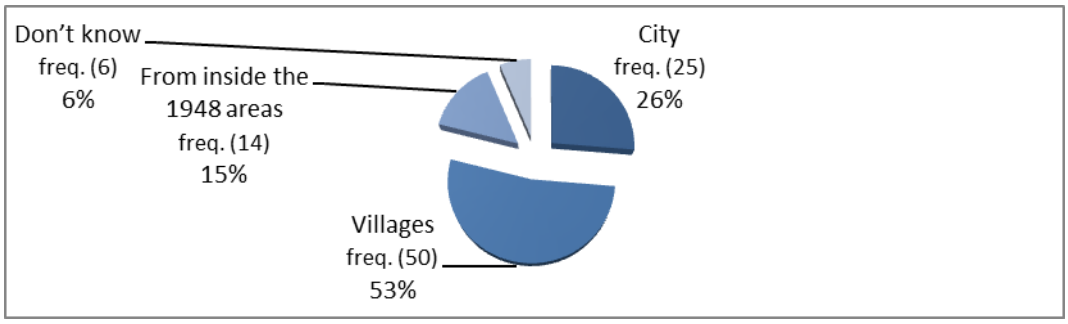

Figure (5.8): Place of residence of most of my patients.

Dentists were also asked about the age groups of most of their patients (Question 15). According to the dentists 59% of the patients' age group (15-30 years), 35% indicated age group (31-46years), 5% indicated that most of their patients are children less than 15 years old, and 1% indicated that most of their patients are more than 46 years (Figure 5.9).

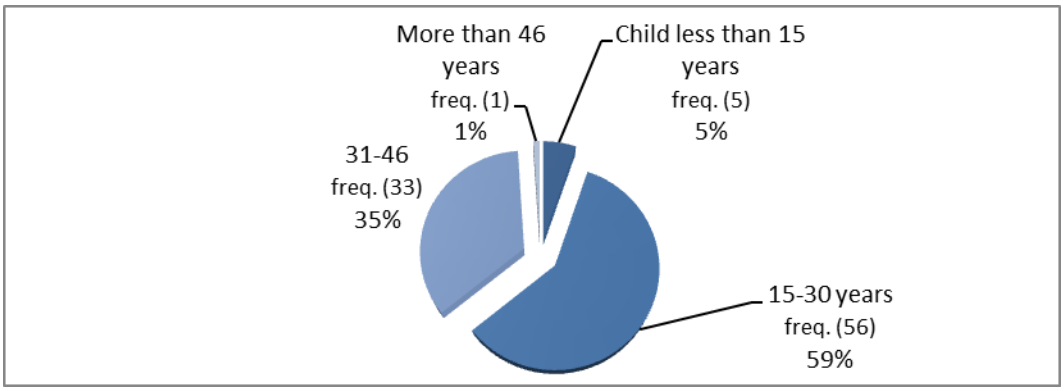

Figure (5.9): Age of my patients.

As for the most frequent type of delivered dental treatment by dentists (Questions 12 about the type of demand), 62% of dentists indicated that the most frequent type of delivered treatment is root canal treatments (RCT), followed by extractions and surgery 24%, 4% conservative and esthetic treatment, 5% prosthetic treatment, 2% treatment of periodontal diseases, 2% orthodontics, and 1% indicated implants as most frequent treatment delivered, Figure (5.10).

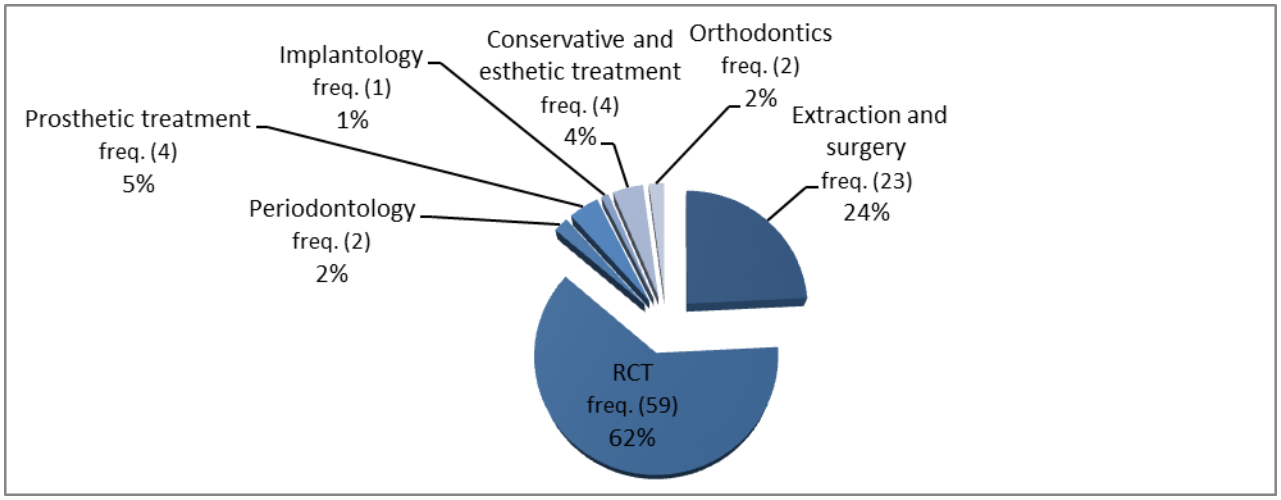

Figure (5.10): The most frequent type of delivered treatments.

Participants dentists were asked about their opinions about patients' awareness (Question number 13). 60% of the dentists indicated that the patients have moderate awareness, 34% said that their patients have little awareness, 5% said that their patients have high awareness, and 1% of the dentists said that they don't know (Figure 5.11).

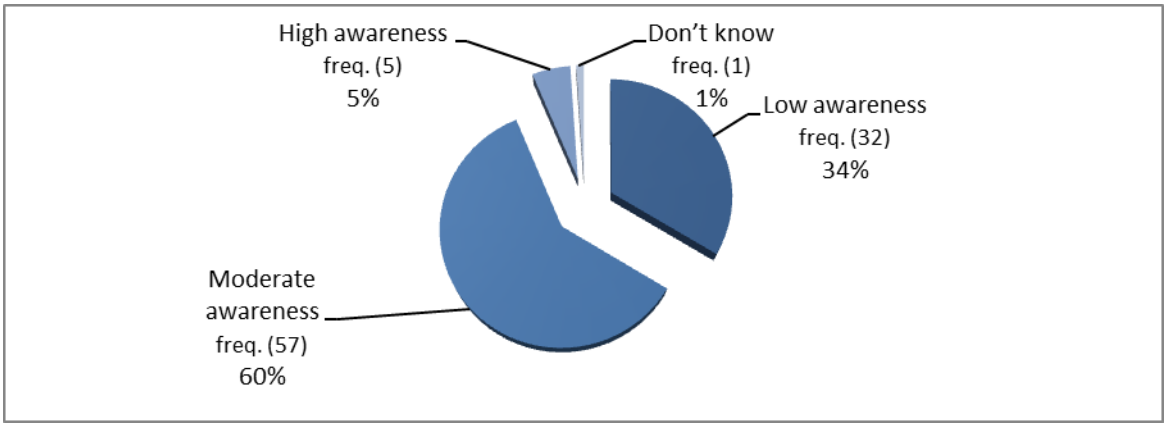

Figure (5.11): Dentists opinion about patients' awareness.

Dentist were asked about if they would like or think to continue their specialty in dentistry(questions number 17), 61% of them said that they want to continue, 28% said that they don't want to continue their specialty, and 11% of dentists don't know whether they will continue on or not (Figure 5.11).

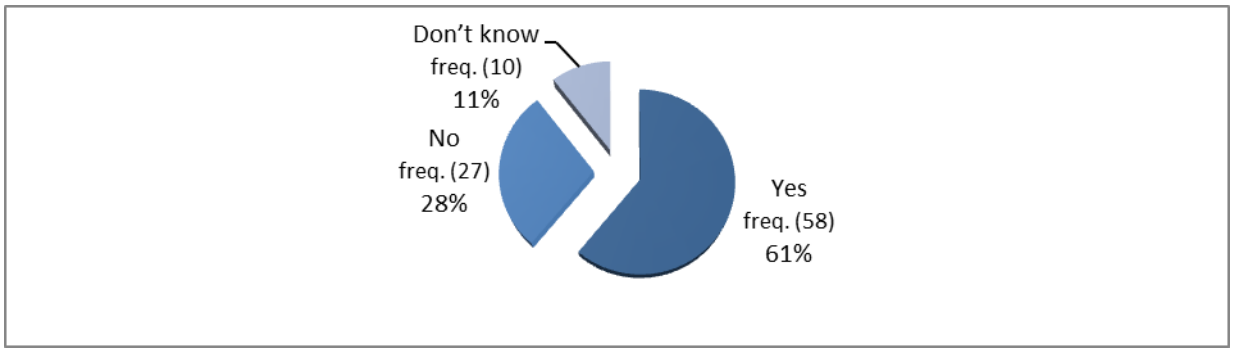

Figure (5.12): Desire of dentists to continue specialty.

Open ended questions were attached to above question; exploring reasons that encouraged dentists to continue their specialty and the field of specialty they would chose. According to this survey those who were encouraged specialty gave reasons that there was an increase in the patients' awareness and consequently there is a need to advance their professional level and deliver better options of treatments for patients. Others related that to the increase in the number of dentists at the bachelor level and that it has become difficult to attract patients in a highly competitive dental care market. In addition to that, some relate that there is a need for more specialized care to respond to the population needs that cannot be delivered with general dentistry qualifications.

Also attached to question number (17), dentists were asked about the specialties that they would recommended or the specialties that they would choose, 10 dentists (23%) said orthodontics, 10 dentists (23%) said oral surgery, 6 dentists (13%) peadodontics, 6 dentists (14%) said periodontology, 5 dentists (11%) endodontic, 3 dentists (7%) implant, 3 dentists (7%) prosthodontics, 1 (2%) operative, (Figure 5.13).

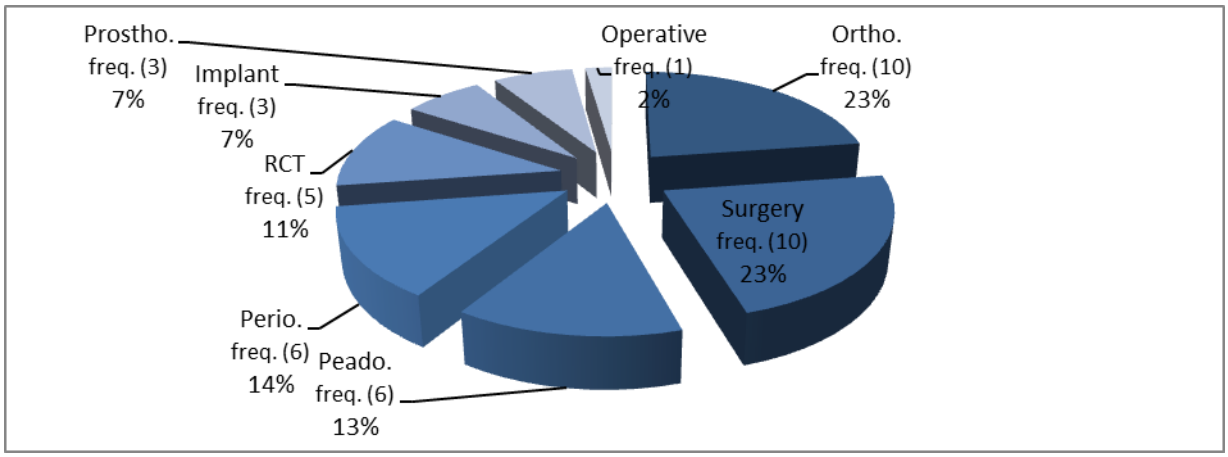

Figure (5.13): Dentists' specialty preference.

5.1.3 Measurement of productivity:

In this part dentists productivity trends and capacity examined and the results about the factors which affect productivity of dentists are presented.

Dentists experience (Question 1): we found that 36% of participants have 5-10 years of experience, 34% have less than 5 years of experience, 18% of dentists have11-15 years, and 12% of dentists have more than 15 years of experience, Figure (5.14).

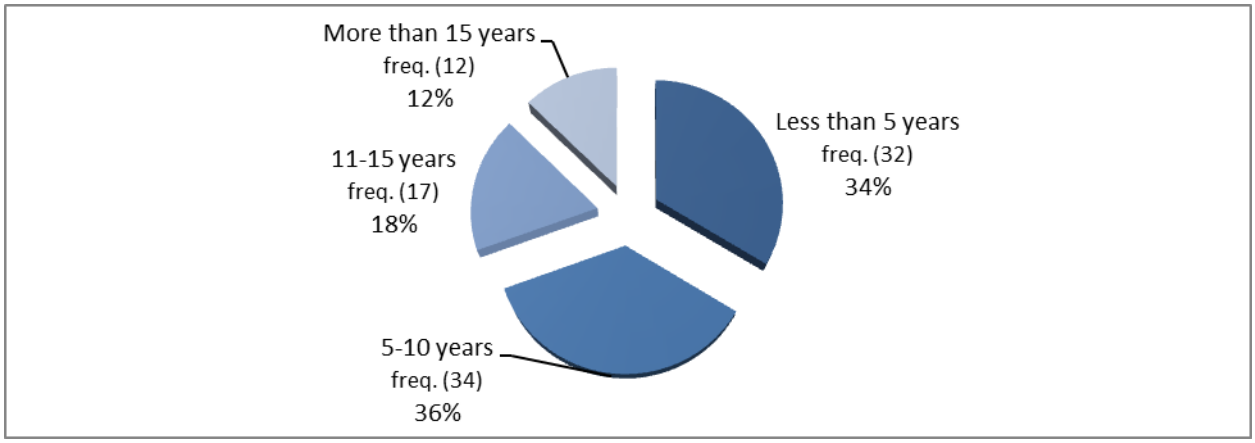

Figure (5.14): Dentists practice years.

An attempt was made to explore dentists working time to measure their productivity. The average working hours (Question 5) was as follow: 41% of participants have an average of working (6-8) hours per day, 29% work 4-6 hours daily, 17% work more than 8 hour daily, and 13% work less than 4 hours per day, Figure (5.15).

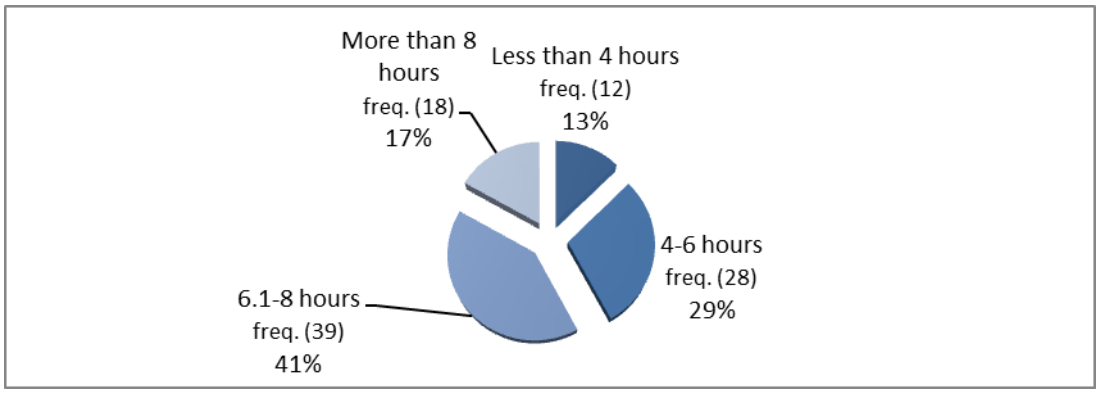

Figure (5.15): Average number of dentists working hours.

Working days (Question 6): 79% of participants work 6-7 days per week, 17% works 3-5 days, and 4% work less than three days per week, Figure (5.16).

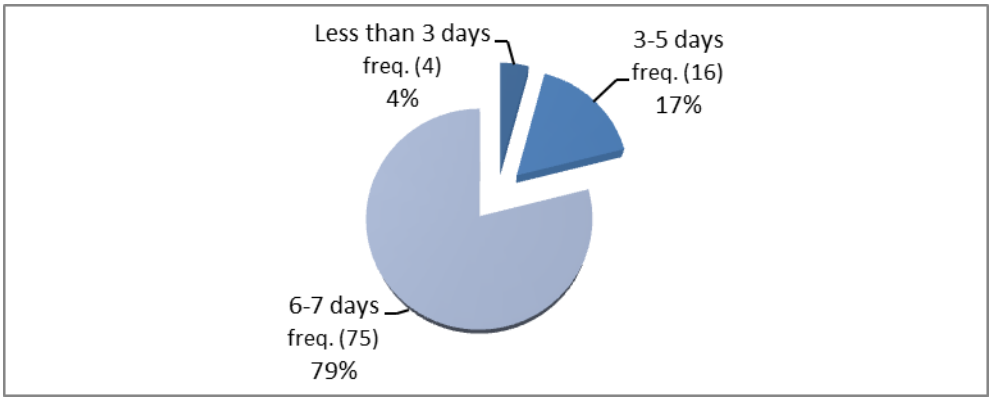

Figure (5.16): Number of dentists weekly working days.

Vacations (question 7): this denotes the number of days the dentists is not working. 63% of dentists indicated that they have less than 15 days' vacation per year, 26% have 15-31 days, 7% have 32-46 days, and 4% of dentists have more than 47 days' vacation per year Figure (5.17).

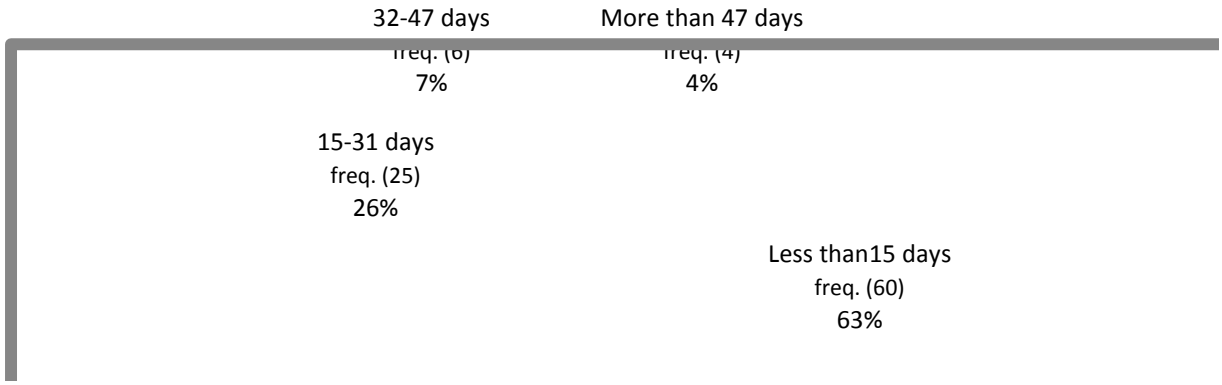

Figure (5.17): Dentists annual vacation days.

Dentist ability to accept more patients (Question 4): 34% of the dentists indicated that they are able to accept to treat (10-20) more patients a week, 26% able to accept less than 10 patients a week, 25% able to accept more than 30 additional patients a week, and 15% of the dentists can accept 21-30 more patients a week, Figure (5.18).

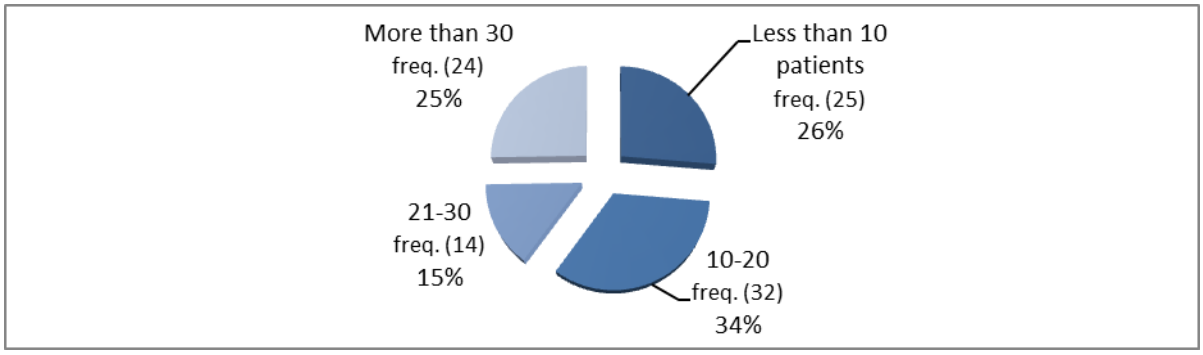

Figure (5.18): Dentists ability to treat more patients per week.

Factors affecting productivity

In the coming section an attempt has been made to explore adjunctive factors that affect the productivity of dentists.

Number of dental units per clinic (Question 18): 80% of the participating dentists have one dental unit, 17% have two dental units, and 3% have more than two dental units in their clinics, Figure (5.19).

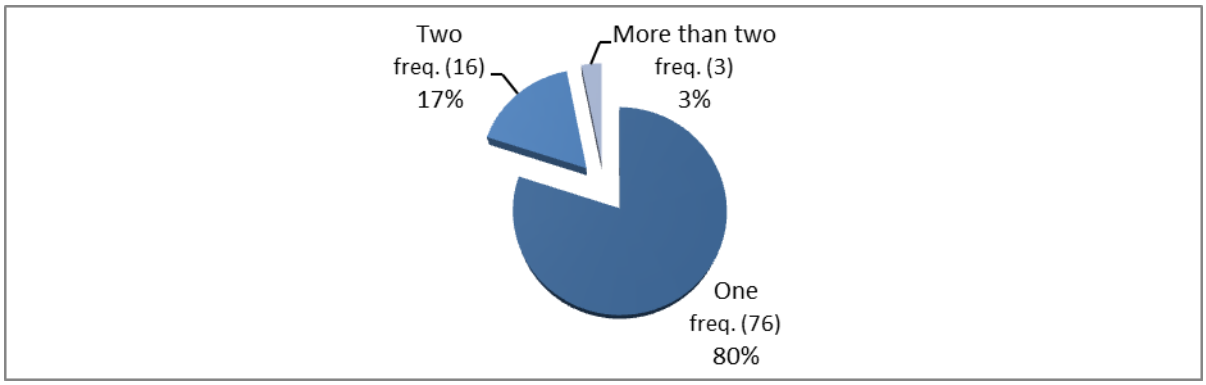

Figure (5.19): Number of dental units per clinic.

Availability of dental assistance in the clinic, (Question 20): while 84% of the participants don't have dental assistance, only 16% of participants have dental assistance, Figure (5.20).

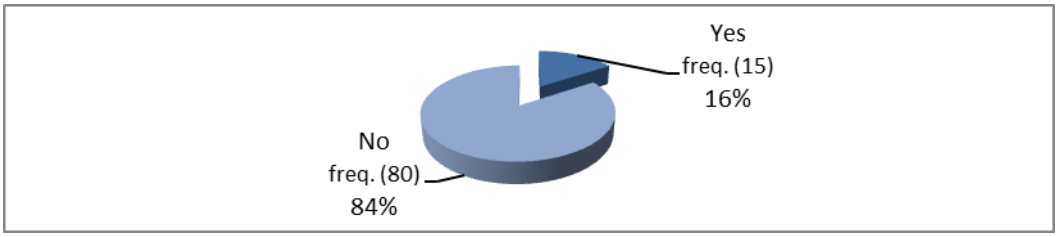

Figure (5.20): Availability of dental assistant.

Availability of receptionist in the clinic (Question 19): 51% of participants have receptionist, while 49% don't have any receptionist, Figure (5.21).

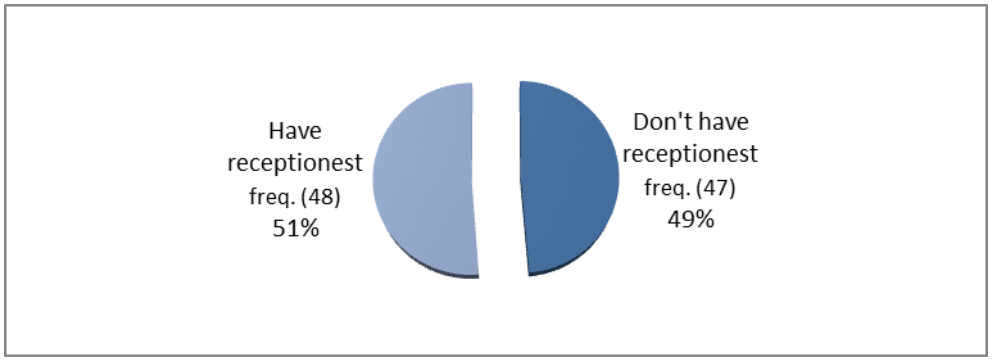

Figure (5.21): Availability of receptionist.

Availability of radiology device (Question 21): 51% of the participants don't have x-ray device, while 49% of participants have x-ray device in the clinic, Figure (5.22).

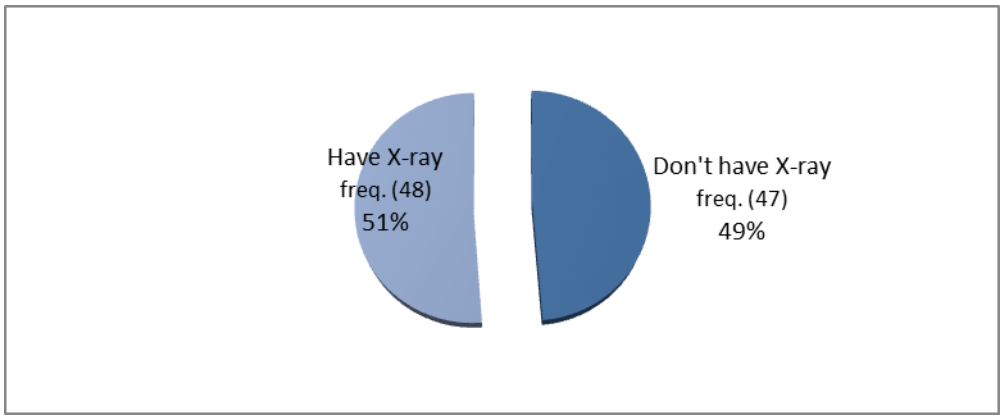

Figure (5.22): Availability of x-ray device.

Availability of dental laboratory (Question 22): 99% of the dental clinics don't have dental laboratory inside the clinic, while only 1% of the clinics have laboratories, Figure (5.23).

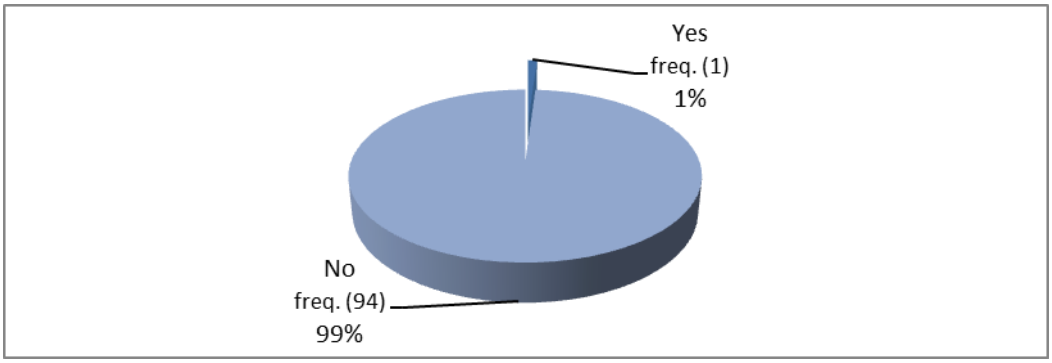

Figure (5.23): Availability of dental laboratory.

5.1.4 Dentists opinions about the profession:

According to 82% of the dentists believe that there is an increase in the number of dentists, while 10% believe that there is no increase, and 8% don't have any view, Figure (5.24).

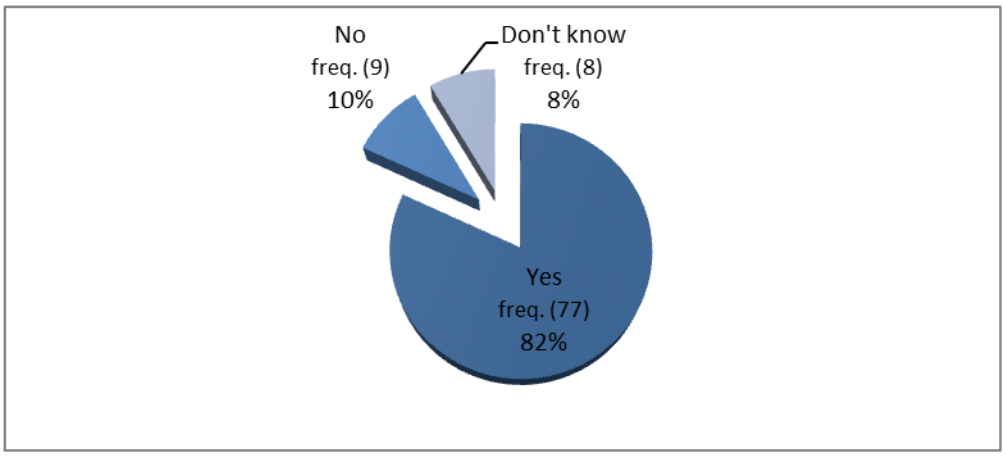

Figure (5.24): Do you believe that there is increase in dentists' number.

5.2 Part two: exploring the relationship between variables

In this part of the results analysis, an attempt has been made to study relations between different variables.

Table (5.2) compares the average monthly income of the participating dentists with the average number of weekly patient's visits to their clinic. We can notice that out of 21.1% of dentists who earn monthly less than 2000 NIS, 60% them treat less than 10 patients a week, 30% out of them treat from 10 to 20 patients a week, and 10% of them treat from 21 to 30 patients a week.

35.8% out of all participants earn from 2000 to 4000 NIS monthly, 61.8%out of them treats from 10 to 20 patients a week, 17.6% treats from 21 to 30 patients a week, 14.7% treats from 31to 40 patients a week, and 5.8% treats more than 40 patients a week. 22.1% of participants who earn 4001-6000 monthly, 9.5% of them treat less than 10 patients a week, 47.6% of them treats from 10 to 20 patients a week, 14.3% treat from 21 to 30, and 9.5% of participants for each category of patients (31-40), (41-50), (more than 50 patients a week). 11.6% of participants earns from 6001 to10 000, 27.3% out of them treat from 10 - 20 patients a week, 36.4% treats from 21 to 30 patients a week, and 36.4% treats from 31 to 40 patients a week. 10% of participants earn more than 10 000 monthly; more than 60% of them treat more than 50 patients a week.

To have more insight into the productivity of the dentists we can also compare the relation between the busyness index and the average patients' visits per week, Table (5.3), as well as the busyness index with the average number of more patients the dentist can accept to treat per week, Table (5.4). Table (5.3) shows that 52.6% (50) of the participant are not busy and would like more patients, 80% (40) of them treat less than 20 patients a week, 20% of them (10 dentists) treats more than 20 patients a week.

Table (5.2): Average net monthly income of the dental clinic by average number of patient visits to the dental clinic

Average net monthly income \ Average number of patients visits		Less than 10	10-20	21-30	31-40	41-50	More than 50	Total
less than 2000 NIS	Frequency	12	6	2	0	0	0	20
	%	60.0%	30.0%	10.0%	.0%	.0%	.0%	100.0%
2000-4000 NIS	Frequency	0	21	6	5	1	1	34
	%	.0%	61.8%	17.6%	14.7%	2.9%	2.9%	100.0%
4001-6000 NIS	Frequency	2	10	3	2	2	2	21
	%	9.5%	47.6%	14.3%	9.5%	9.5%	9.5%	100.0%
6001-10000 NIS	Frequency	0	3	4	4	0	0	11
	%	.0%	27.3%	36.4%	36.4%	.0%	.0%	100.0%
1001-15000 NIS	Frequency	0	1	1	1	0	1	4
	%	.0%	25.0%	25.0%	25.0%	.0%	25.0%	100.0%
More than 15000 NIS	Frequency	0	0	1	1	0	3	5
	%	.0%	.0%	20.0%	20.0%	.0%	60.0%	100.0%
Total	Frequency	14	41	17	13	3	7	95
	%	14.7%	43.2%	17.9%	13.7%	3.2%	7.4%	100.0%

On the other hand, Table (5.4) shows that of these 52.6% participant (50 dentists) who are not busy and want more patients 46% participant (23 dentists), can accept to treating additionally less than 20 patient per week, while 54% of them able to treat additionally more than 20 patients per week. 38.7% of participants have enough patients and can

manage more patients, 78.3% of them can manage additionally to treat less than20 patients per week, 21.6% of them can manage to treat additionally more than20 patients per week.

We can conclude that in general almost half of the participant dentists are not busy and can increase their productivity even for more than the 50%.

Table (5.3): Busyness index of the dentists by average number of patients visit to dental clinics

Busyness index \ Weekly average number of patients visit to dental clinic		less than 10	10-20	21-30	31-40	Total
Not busy want more patients	Frequency	13	27	4	3	2
	%	26.0%	54.0%	8.0%	6.0%	4.0%
Enough patients and i can manage	Frequency	1	12	11	8	1
	%	2.7%	32.4%	29.7%	21.6%	2.7%
Deliver dental care to all p. but that over my capacity	Frequency	0	1	1	1	0
	%	.0%	33.3%	33.3%	33.3%	.0%
Very busy and need no more patients	Frequency	0	1	1	1	0
	%	.0%	20.0%	20.0%	20.0%	.0%
Total	Frequency	14	41	17	13	3
	%	14.7%	43.2%	17.9%	13.7%	3.2%

Table (5.4): Busyness index of dentists by average number of more patients the dentist can accept to treat per week

Busyness index \ Average of more patients dentist can accept to treat per week		less than 10 patients	10-20	21-30	More than 30	Total
Not busy want more patients	Frequency	11	12	12	15	50
	%	22.0%	24.0%	24.0%	30.0%	100.0%

Enough patients and i can manage	Frequency	11	18	2	6	37
	%	29.7%	48.6%	5.4%	16.2%	100.0%
Deliver dental care to all p. but that over my capacity	Frequency	1	1	0	1	3
	%	33.3%	33.3%	.0%	33.3%	100.0%
Very busy and need no more patients	Frequency	2	1	0	2	5
	%	40.0%	20.0%	.0%	40.0%	100.0%
Total	Frequency	25	32	14	24	95
	%	26.3%	33.7%	14.7%	25.3%	100.0%

Busyness of dentists, working hours per week: In Table (5.5) we can see that 52.6% of participants who are not busy and wants more patients, 12% work less than 4 hours a day, 20% of them work from 4-6 hours a day, 52.2% of them work 6.1-8 hours per day and 16% of them work more than 8 hours a day. While 38.9% of participants have enough patients and can manage more patients, 13.5% of them work less than 4 hours a day, 40.5% work from 4-6 hours a day, 27% of them work 6.1-8 hours per day, and 18.9% work more than 8 hours a day.

Table (5.5): Busyness index of dentists by average daily working hours at dental clinic

Busyness index \ Average of daily working hours at dental clinic		less than 4 hours	4-6 hours	6.1-8 hours	More than 8 hours	Total
Not busy want more patients	Frequency	6	10	26	8	50
	%	12.0%	20.0%	52.0%	16.0%	100.0%
Enough patients and i can manage	Frequency	5	15	10	7	37
	%	13.5%	40.5%	27.0%	18.9%	100.0%
Deliver dental care to all p. but that over my capacity	Frequency	0	1	2	0	3
	%	.0%	33.3%	66.7%	.0%	100.0%
Very busy and need no more patients	Frequency	1	2	1	1	5
	%	20.0%	40.0%	20.0%	20.0%	100.0%
Total	Frequency	12	28	39	16	95
	%	12.6%	29.5%	41.1%	16.8%	100.0%

Table (5.6): explore relation between busyness and weekly working days 52.6% of participants who are not busy and want more patients, 2% out of them work less than 3 days per week. 16% work 3-5 days per week, 82% work from 6-7 days per week. 38.9% of participants have enough patients and can manage more patients, 78.4% of them work 6-7 days per week, while 21.6 work less than 5 days per week.
This shows that almost half of participants are full time employee and they are not busy and would like more patients.

Table (5.6): Busyness index of dentists by number of working days per week

Busyness index \ Average of working days per week		Less than 3 days	3-5 days	6-7 days	Total
Not busy want more patients	Frequency	1	8	41	50
	%	2.0%	16.0%	82.0%	100.0%
Enough patients and i can manage	Frequency	3	5	29	37
	%	8.1%	13.5%	78.4%	100.0%
Deliver dental care to all p. but that over my capacity	Frequency	0	1	2	3
	%	.0%	33.3%	66.7%	100.0%
Very busy and need no more patients	Frequency	0	2	3	5
	%	.0%	40.0%	60.0%	100.0%
Total	Frequency	4	16	75	95
	%	4.2%	16.8%	78.9%	100.0%

Table (5.7) shows relation between busyness index and dentists place of work. 80% out of 82.1% of dentists who work in the city are not busy and want more patients, while in the village there is 20% out of 17.9% of participant who work in the village and need more patients. We can see clearly that participants in the city in comparison with the villages are not busy and need more patients.

Table (5.7): Dentists place of work by busyness index

Busyness index \ Dentist place of work		City	Village	Total
Not busy want more patients	Frequency	40	10	50
	%	80.0%	20.0%	100.0%
Enough patients and i can manage	Frequency	31	6	37
	%	83.8%	16.2%	100.0%
Deliver dental care to all patients but that over my capacity	Frequency	3	0	3
	%	100.0%	.0%	100.0%
Very busy and need no more patients	Frequency	4	1	5
	%	80.0%	20.0%	100.0%
Total	Frequency	78	17	95
	%	82.1%	17.9%	100.0%

Table (5.8) compares dentists' place of work with the type of delivered treatment. We can notice that 82.1% of the dentists deliver their services in the city, 21.8% of them deliver at most dental extractions, 64.1% of participants deliver root canal treatments (RCT), 1.3% of participants deliver periodontics treatments, 5.1% of participants deliver prosthodontics, 3.8% of participants deliver conservative treatments, 2.6% of participants deliver orthodontics, and 1.3% of participants deliver implants. While 17.9% of participants deliver their services in villages, 35.3% of them deliver dental extractions, 52.9% of them deliver root canal treatments (RCT), 5.9% deliver periodontology, and 5.9% of them deliver conservative treatments. According to these findings we conclude that most of the female dentists tend to work fewer hours than male dentists.

Table (5.8): Dentists place of work by most frequent type treatment delivered in dental clinics

Dentist place of work	Most frequent type of delivered treatment to patients in dental Clinic	Surgery	RCT	Perio.	Prostho.	Implant	Conse.	Ortho.	Total
City	Frequency	17	50	1	4	1	3	2	78
	%	21.8%	64.1%	1.3%	5.1%	1.3%	3.8%	2.6%	100.0%
Village	Frequency	6	9	1	0	0	1	0	17
	%	35.3%	52.9%	5.9%	.0%	.0%	5.9%	.0%	100.0%
Total	Frequency	23	59	2	4	1	4	2	95
	%	24.2%	62.1%	2.1%	4.2%	1.1%	4.2%	2.1%	100.0%

Table (5.9) the productivity is compared with the gender of the dentist. 67.4% of participants are males, 10.9% of them have less than 10 patients a week, 40.6% of them have 10 to 20 patients a week, 18.8% have 21 to 30 patients a week, 15.6% of them have 31to 40 patients visits a week, 3.1% of them have from 41 to 50 patients visits a week, 10.9% have more than 50 patients visits a week.

32.2% of female dentists distribute the average of patients visits as follow: 22.6% have less than 10 patients visits a week, 48.4% have from 10 to20 patients visits a week, 16.1% have from 21-30 patients visits weekly, 9.7% have from 31 to 40 patients visits weekly, 3.2% have from 41 to 50 patients visits weekly. We can see that female dentists tend to have more patients visits from 0-20, than males.

Table (5.9): Sex of the dentists by average number of patients' visits to the dental clinic

Sex of dentist	Average of patients visits to dental clinic	less than 10	10-20	21-30	31-40	41-50	More than 50	Total
Male	Frequency	7	26	12	10	2	7	64
	Row %	10.9%	40.6%	18.8%	15.6%	3.1%	10.9%	100.0%
	column %	7.4%	27.4%	12.6%	10.5%	2.1%	7.4%	67.4%

Female	Frequency	7	15	5	3	1	0	31
	Row %	22.6%	48.4%	16.1%	9.7%	3.2%	.0%	100.0%
	column %	7.4%	15.8%	5.3%	3.2%	1.1%	.0%	32.6%
Total	Frequency	14	41	17	13	3	7	95
	Row %	14.7%	43.2%	17.9%	13.7%	3.2%	7.4%	100.0%
	column %	14.7%	43.2%	17.9%	13.7%	3.2%	7.4%	100.0%

Table (5.10) compares the sex of the dentists to the average working hours per day, 67.7% of males participants, 9.4% of them work less than 4 hours daily, 25.4% of them work from 4 to 6 hours daily, 42.2% of them work from 6.1 to 8 hours daily, 23.4% of them work for more than 8 hours daily. 32.6% of participants are females, 19.4% of them work less than 4 hours daily, 38.7% of them work from 4 to 6 hours daily, 38.7% of them work from 6.1 to 8 hours daily, 3.2% of them work more than 8 hours daily.

Table (5.10): Sex of the dentists by the average daily working hours at dental clinic

Sex of dentist \ Average daily working hours at dental clinic		less than 4 hours	4-6 hours	6.1-8 hours	More than 8 hours	Total
Male	Frequency	6	16	27	15	64
	Row %	9.4%	25.0%	42.2%	23.4%	100.0 %
	column %	6.3%	16.8%	28.4%	15.8%	67.4%
Female	Frequency	6	12	12	1	31
	Row %	19.4%	38.7%	38.7%	3.2%	100.0 %
	column %	6.3%	12.6%	12.6%	1.1%	32.6%
Total	Frequency	12	28	39	16	95
	Row %	12.6%	29.5%	41.1%	16.8%	100.0 %
	column %	12.6%	29.5%	41.1%	16.8%	100.0 %

Table (5.11) compares the sex of dentists with number of working days a week. 67.4% of participants are males, 3.1% work less than 3 days a week, and 7.8% works from 3 to 5 days a week and 89.1% of them work from 6 to 7 days a week.

35.2% of participants are females, 6.5% of them work less than 3 days a week, 35.5% of them work from 3 to 5 days a week, 58.1% of them work from 6 to 7 days a week.

Table (5.11): Sex of dentists by number working days per week

Sex of dentist \ Number of working days		less than 3 days	3-5 days	6-7 days	Total
Male	Frequency	2	5	57	64
	Row %	3.1%	7.8%	89.1%	100.0 %
	column %	2.1%	5.3%	60.0%	67.4%
Female	Frequency	2	11	18	31
	Row %	6.5%	35.5 %	58.1%	100.0 %
	column %	2.1%	11.6 %	18.9%	32.6%
Total	Frequency	4	16	75	95
	Row %	4.2%	16.8 %	78.9%	100.0 %
	column %	4.2%	16.8 %	78.9%	100.0 %

5.3 Regression line analysis

The multiple regression models were done for demand measurements that included all significant variables.

Model (1):

$$Y1= 0.291+0.159X1+0.105X2+0.270X3+0.164X4-0.207X5+0.182X6+0.119X7$$

Where:

Y1	**Busyness index for dentists**
X1	Dentists' gender
X2	Dentists' place of work
X3	Years of practicing dentistry
X4	Average of patients visits to dental clinic
X5	Average of daily working hours in dental clinic
X6	Number of dental units in dentists clinic
X7	Average of net monthly income for dentists

The model performance was significant, and it was reflected by the f-test value (8.634) as shown in table in annex (14), which reflect the effects of the independent variables (years of practicing dentistry, average of patients visit to dental clinic, average of daily working hours, dentists' gender, dentists place of work, number of dental units at your dental clinic, average of net monthly income for your dental clinic), on the dependent variable (Busyness index for dentists), this lead us to depend on this model to see the effect of variables in our model as we will see in the chapter six.

First demand measurement in Model (1) is busyness index, and there is significant relation influence it with the following factors as following:

- The first independent variable is dentists' gender. As it is shown from the regression analysis that it affects positively on the busyness of the dentist, which means that females are busier than males.
- The second variable is dentists' place of work. As it has been shown in the regression analysis that it affects positively the busyness index of dentists, which means that dentists practicing in villages are busier than dentists practicing in the city.
- Years of practicing dentistry have positive affect on the model, which means that there is increase in busyness index of dentists with the increase in experience or practicing years.
- The dentists busier where there is increase in the average of patients' visits to dentists.
- The average of number of working hours reflected negatively on dentists' busyness, which means when there is increase in dentists working hours the dentists are less busy.
- As we see from positive effect of variable six, when there is increase in dental units, the dentists become busier.
- As we see from variable seven, when the dentists are busier there is increase in their net monthly income.

Model (2):

Y= 0.594 - 0. 123X1 - 0.361-X2 + 0.272X3 + 0.272X4 +0.353X5 + 0.812X6
Where:

Y2	**Average of net monthly income for dentists**
X1	Availability of dental assistance
X2	Dentists gender
X3	Years of practicing dentistry
X4	Average of patients visits to dental clinic
X5	Average of daily working hours in dental clinic
X6	Number of dental units in dentists clinic

The model performance is significant, and it was reflected by the f-test value (14.406) as shown in table in annex (15) , which reflected the effects of the independent variables (Dentists gender, Years of practicing dentistry, Average of patients visits to dental clinic, Average of daily working hours at clinics, Number of dental units at clinic) on the dependent variable (Average of net monthly income for your dental clinic), this lead us to depend on this model to see the effect of variables in our model as we will see in the chapter six.

The second demand measurement in (model 2) is monthly income; the following factors affect it as following:

- Availability of dental assistance in the clinic affects the model in a negative way, this means when there is dental assistance there is less monthly income for the dentists.
- Dentists gender affect negatively on monthly dentists' income, this means that females' dentists have lesser monthly income than males' dentists.
- Years of practicing dentistry affect positively on dentists income, this means that with increase in practicing years there will be increase in dentists' income.
- Average of patients' visits' affects positively on dentists' income, this means when there is increase in patients' visits there is increase in dentists' monthly income.
- Average of working hours affect positively on dentists' income, this means with increase in working hours there is increase in dentists' income.

- Number of dental units affect positively on dentists income, this means that where there is increase in dental units there will be increase in dentists' income.

5.4 Part three: the Supply of Dental Health Personnel

The data regarding dentists' number derived from the Palestinian Dental Association (PDA) annual records as showed in Table (5.2). The retention period of dentists in profession, is relatively long because of late retirements of dentists. We considered attrition rate of 3% for the last five years due to death, retirements and altering the career, other causes were not considered because we assumed that their cessation of practice is temporary and they are still considered a prospective source of supply. After counting the attrition rate, out of 165 registered dentists we have 160 dentists.

5.4.1 Projected future dentists' number:

The projected number of dentists till 2015 was estimated using regression line analysis, considering 2005 as a baseline year, subtraction from it the attrition rate of dentists for the last 5 years which is around 3% due to death, retirements and altering the career.
Depending on regression analysis the following formula was used: $y = 7.7108x - 15333$
As we see from the Figure (5.25), the relation is almost linear and estimation in such a case have small margin of error, which is = -0.3156.

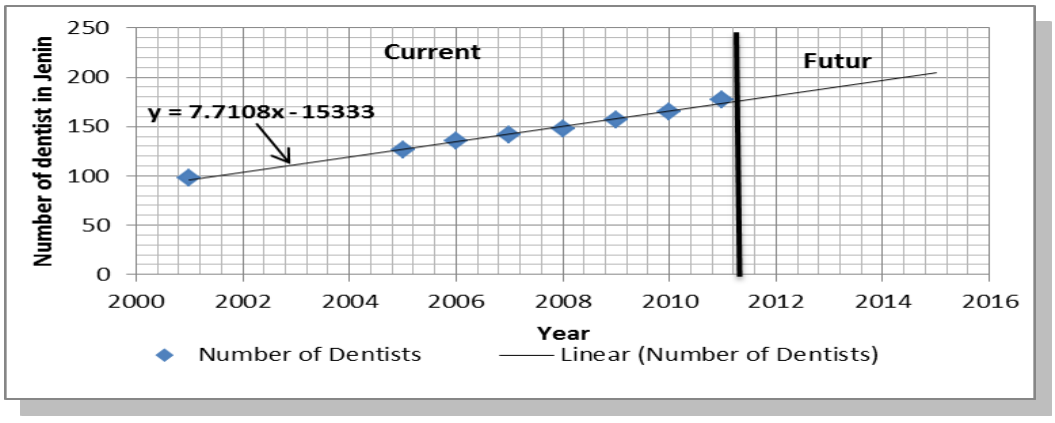

Figure (5.25): projected number of dentists till 2015.

Using this formula we can project the expected number of dentists in 2015 is around 204 dentists, and subtracting from that the expected attrition number in coming 5 years which is 6 dentists' shows that the estimated number of dentists in 2015 is 198 dentists. Table

(5.2); shows the real dentists' number and estimated number according to given formula without counting the attrition rate.

5.4.2 Estimation of dentists Requirements:

Two approaches were approved to estimate dentists' requirements; the dentist to population ratio approach and health needs services approach.

5.4.2.1 Dentist to population ratio approach:

In this approach we estimated required dentists' number, depending on recommended ratio by WHO for developing country, 1 dentist: 5,000 inhabitants (Joint WHO/FDI Working Group, 1989). The ratio chosen varies from country to country, takes no account to power of demand or actual needs for services, and it is open to various political influences.

The Projection of dental health manpower requirements by this method is shown in Table (5.2). The following relationship used to determine the number of dentists (N): $(N=P\times r)$, Where P is the population and r is required ratio.

In (2010) there were 165 dentists registered in PDA, and population in Jenin was 274,001 inhabitants. Making the ratio of dentists to population: 1dentist : 1660.6 inhabitants, while it is recommended by WHO that this ratio has to be 1 dentist : 5000 inhabitant.

According to the PCBS the population number in 2010 was 274.001, and according to (Dalen Kristin & Pedersen Jon, 2004) the growth rate for population in 2015 will be 1.3, this will increase the population number in 2015 to 356.201. Calculating the recommended ratio by WHO, the requirement of dental health personnel in 2005 was 42 and in 2015 will increase to 71.24, while there is in 2005 126 dentists and according to the present growth rate it is expected to be 198 dentists in 2015.

Table (5.12): Dental workforce numbers, projections, and estimation for needed supply using WHO dentist per population ratio

Year	Population in Jenin	Recommended ratio by WHO 1\5000	Available dentists number	Available Dentist to pop. ratio 1\5000	Estimated Number of Dentists
2005	240 023	48	126	2.62	127.154
2006	246 696	49.3	135	2.73	134.8648
2007	253 558	50.71	142	2.80	142.5756
2008	260 216	52	148	2.84	150.2864
2009	267 027	53.4	157	2.94	157.9972
2010	274 001	54.8	165	3.01	165.708
2011	---	---	177	---	173.4188
2012	---	---	---	----	181.1296
2013	---	---	---	----	188.8404
2014	---	---	---	----	196.5512
2015	356 201	71.24	---	----	204.262

5.4.2.2 Oral needs/ service approach:

In order to reduce the decayed components of the DMF score for this age group from the current (84%) (Sabha, 2007) to 74%, some teeth will have to be extracted (planned, 10%) while others (90%) will have to be filled. Dental caries will be removed by scaling and polishing (Khan & Sithole, 1991). Dentists will be expected to be able to perform all of these procedures with a total of 41,522 hours a year for population of 54,327 for age group (10- 14) years old for the year 2010 (PCBS, 2008; Dalen & Pedersen, 2004) as follow:

- Extractions (target : DMF= 1,5 through extraction of 10% of decayed teeth) of total population 54,327 then the targeted population will be 5432, assuming 20 minutes for extraction (Khan and Sithole, 1991), for each 5432 then we need 1810 dentist hours.
- Filling (target: DMF= 1,5 through filling of 90% of decayed teeth) then we target 48,894 of total population, assuming the average time for filling 30 minutes (Khan and Sithole, 1991), then we need in total 24,446 dentist hours.
- Scaling and polishing (prophylactic) (target: 56.2% of population, we have 30,532 assuming that dentists need 30 minutes to finish his duties (Khan and Sithole, 1991), then we need 15266 dentist hours.

  According to the findings of this study most dentists work 8 hours a day, 6 days a week and have less than 15 days at vocation, adding to this 12 days national holidays. According to this each dentist assumed to work 2 280 hours per year, according to this formula: (8 hours per day×6 days per week×25 weeks-15 days at vocation×8 hours-12 days national holidaies×8 hours).

  Required dentists' number:

  According to the need for given population in 2010 we just need 18 dentists to perform the 41 522 hours of dental work per year. Applying two scenarios of (a 20% underestimation and a 20% overestimation of annual working time) results in a rough estimate of annual working times of 33,217.6 and 49,826.4 hours respectively. According to the suggested two scenario, if there is underestimate we need around 15 dentists, and if there is overestimation the required dentists around 22 dentists.

Chapter six

Discussion and Conclusions

6.1 Introduction

The most distinguishing feature of this study is identifying the imbalance between demand for dental services and supply for dentists in Jenin district. This study provides a baseline and a great tool for dental human resource planning.

This chapter is divided into two parts. In the first part, demand trends was studied to evaluate the power of demand for dental services on one side and the relation to productivity of dentists on the other side.

The second part includes discussion about dentists supply, identifying current dentists' supply, projecting the future supply of dentists, and estimating the required supply of dentists using two different approaches; dentists to population ratio approach and the oral needs/ service approach.

6.2 Demand and productivity measurements

Demand for dental care reflects peoples' need or desire for dental care and willingness to pay at market prices.

Demand is expressed through the use of dental services, and hence it can be measured in dental visits made and services received within a year. This study provides information about demand for dental care by Jenin population in 2010. This information is presented to evaluate the trends of demand for dental care.

A total of 95 dentists accepted to participate in this survey. The response rate achieved by the study (82.6%) was higher than similar studies, e.g. in a survey conducted in Australia to measure trends of productivity of dentists, the response rate was 70% (Australian Research Center for Population Oral Health, 2006). Another study conducted in Scotland targeting dentists showed that the total response rate was 62% (Nuttall, Steed, & Donachie,

2002). Also survey targeting Nigerian dentists' illustrated that the response rate was 82.4% (Adeniyi & Onajole, 2004).

Most of the surveyed dentists (79%) work (6-7) days' weekly. (58%) of them work for more than (6) hours a day with a (≤ 5) daily number of patients visits in average. This study shows a lower number of patients seen by dentists in comparison to the number of patients seen in other countries, for example in Thailand dentists have around ten patients a day (Komson, Suwit, & Duangjai, 1995). Another survey conducted in Canada by Canadian dental association shows similar result with an average of 65 patients' visits per week (The Canadian Dental Association, 2005). The above figure gives a strong representation of the weak demand of dental services in Jenin district. This finding supported by question for dentists about their opinion at the average of patients visits, where 92% of participants range patients' visits to dentists from weak to moderate. We might refer the cause for low patients' visits to dentist to the absence of the culture of regular dentist visits in Jenin society and the low economic status.

This survey showed that the majority of the participants dentists (92%) are either facing less patients or having a high productivity to treat more patients as shown in Tables (5.4), (5.5), (5.6). The above figure supports the previous finding and gives a punctual representation that dentists can absorb any anticipated increase of demand for dental services.

By applying the market rule of supply and demand, which states that the increase in demand of dental services is balanced by the increase in supply, we notice that this rule is not applicable in Jenin market. Comparing demand of dental services in Jenin with the well-established economic country, Canada, we found that patients' visits to dentists in Canada are higher than in Jenin, and the size of patients expenditure per capital on dental services was higher in Canada (380$) than in Jenin (147$) (The Canadian Dental Association, 2005). On the other hand, the concentration of dentists in Jenin (3.1/5000) is higher than Canada (2.88/5000). This clearly shows that we cannot depend only on the market rule of supply and demand to keep dentists workforce with balance of demand. There also has to be some rules and regulations by the Palestinian Authority or Professional Association to control it.

As a consequence of weak economic situation and hard living conditions of people under occupation which affects patients expenditure on health issues and reflects on the low patients' number, dentists suffer from a low monthly income as shown in Table (5.2). This relation is further investigated in coming paragraph.

Considering the annul expenditure for dental treatments as economic measures will help us to specify the population demand for dental services. According to this survey (57%) of dentists say that patients expend less than 500 Shekel (< 147$) for dental care annually, while 31% indicate that their patients expend from 501 to 1000 Shekel (147-293$). This finding is supported by the opinion question of dentists about the yearly patients' expenditure for dental care, which shows that 86% of participants range their patients' expenditure is between weak to moderate, while 57% of the participating dentists earn less than 4000 NIS per month. This is not an encouraging economic environment which can support better demand for dental services.

The questionnaire was designed to define the responsible population who order the most frequent demand for dental services, to help us to evaluate trends in demand according to the responsible population.
According to this survey, 96% of participant dentists said that females represented a significant number of their patients, and according to (PCBS, 2007), females are less in number than males. This shows that the largest group of male population does not apply enough demand in comparison with females. This finding cannot advance better demand for dental services.

The survey showed also that most of participant dentists (82.1%) deliver their services in the City, while (17.9%) of them work in the villages. It worth to note that (53%) of patients come from villages seeking for dental care, according to this figure more than half of patients subjected to difficulty in movements among villages on one side and villages and city in the other side, mainly due to checkpoints and security measures of the Israeli army. In addition to the separation wall which decreases the number of Arab patients' coming from the 1948 areas, this situation together with misdistribution of dentists will greatly affect the access for dental care and leave the demand for dental care uncertain.

Assessing differences in type of delivered dental care between urban and rural areas, data in Table (5.8) shows the type of delivered dental care in relation to places where these services are delivered (urban or rural areas). The findings showed (53%) of the participant dentists patients who are from rural areas seek more emergency treatments and they tend to extract their tooth rather than seeking services to save them. This finding is similar to a study conducted in Australia (AIHW Dental Statistics and Research Unit, 2002).
This type of demand for dental care cannot support better demand.

Data in Table (5.7) show that dentists serving in city have more free time, lesser busyness index than those serving in villages because of the concentration of dentists in the City. Similar results were reached in a study conducted in (Office of Rural Health & Primary Care, 2005). This point out the importance of redistribution of dentists' clinics based the population needs. This would only be possible through a regulatory system that licensing new clinics based on needs of the population.

Although the norms for the percentage of the population requiring dental treatment are difficult to verify, we applied the figures from the WHO/FDI methodology for developing countries (WHO /FDI, 1989). Table (6.1) shows the results of 3 different scenarios of patient demand (maximal, intermediate and minimal).
Table (6.1): Percentage of patients demand per age cohort estimated according to different scenarios

Age cohort	**Patient demand scenario**		
	Maximal demand (% of patients)	Intermediate demand (% of patients)	Minimal demand (% of patients)
0–14 years	100	90	80
15–29 years	85	75	65
30–64 years	65	50	35
65–79 years	30	20	10

In this survey, we found that age distribution was dominated by patients aged 15-30 years which represents 59%. There had been a shift away from children towards young adults and middle-aged. When we compare the percentage of this age group with minimal supposed percentage (65%) by WHO for developing country, we note that the size of

demand for this age group is less than the minimal size recommended by WHO, which strongly supports the suggestion of weak demand.

This survey explores trends in demand for dental care which showed that 86% of dental services provided in Jenin district are confined to RCT and dental extractions, while very few patients seek treatments for esthetic, prosthetic and periodontal purposes. Comparing this finding with a study conducted in Australia, we notice that 69.6% of patients demand prosthetic and crown and bridge treatments (AIHW Dental Statistics and Research Unit, 2008). As we note this type of demand which is associated with urgent needs, reflects weak type of demand and weak awareness to importance of dental care. This confined utilization for dental services to pain and to necessarily need which would weaken demand power for dental services.

The above finding examined by direct opinion question for dentists about their evaluation of their patients' awareness, the survey results shows that: 93.7% of dentists range patients' awareness for dental treatments from weak to moderate. This result will support previous findings of weak awareness and utilization for dental services.

This survey provides information about trends in the productivity of dentists in Jenin. Data are presented with respect to factors which affect their productivity.

According to this survey, 70% of participants' dentists have less than 10 years of experience and only 30% of them have more than 11 years of experience. According to a survey conducted in Australia measuring productivity of dentists (Australian Research Center for Population Oral Health, 2006), dentists with more than 10 years' experience have more productivity than dentists who have less experience. As we note, most of the dentists are young, having more retention rate in profession and their productivity can be further improved with training and experience. This finding support previous suggested finding that productivity of dentists can be enhanced to absorb any suggested increase in demand for their services.

This survey also shows that 58% of participants' dentists work for more than 6 hours daily, 79% of participants work 6-7 days per week, and 63% of participants have less than 15 days vocation in a year. Comparing this to around 33 working hours per week for the average dentists in Canada in 2006, we note that this equals 5.5 working hours daily (The Canadian Dental Association, 2005). Dentists in Jenin tend to work more hours weekly than Canadian dentists. Calculating working hours per year for average dentists in Jenin, we will come out with a sum of (2 280) hours a year which is much higher than working hours average per year for Lebanese dentists which is around 1050 hours per year (Doughan, 2003) and average working hours average for Australian dentists which is around 1800 hours a year (Australian Research Center for Population Oral Health, 2006). As we see, the average working time for most of Jenin dentists is more than other dentists in different places. This might be referred to dentists trying to increase their duty time to catch or absorb more patients. We conclude that they can absorb more demand on their services.

The percentage of female dentists in Jenin (32.6%) is more than in Canada (25%) (The Canadian Dental Association, 2005). This might be explained because there is more demand for female dentists in our conservative society, as we saw previously the female patients represent significant amount of all patients visiting dentists, and they might prefer female dentists according to cultural value.

According to the study findings, most of the female dentists tend to work as part-timers. Analysis in Tables (5.9), (5.10), (5.11) proves that females tend to have less working hours weekly and less productivity than males. This finding is in accordance with other studies finding in Australia (National Australia Bank Limited, 2009), (Australian Research Center for Population Oral Health, 2006). This might be because female dentists have a duty of marriage, pregnancy and taking care of their children’s decreasing their clinical working hours.

There is also a growing trend to practice dentistry in the form of dental centers that have more than one dental unit. According to this survey, 20% of participants have more than 2 dental units. Practicing in dental centers where many colleagues collaborate to deliver

services is more productive than working in single units. Comparing our finding with other findings in a study conducted in Canada in 2006, we note that there are (24.1%) of practices with two dentists (The Canadian Dental Association, 2005). Explaining the spread of this trend in Jenin, referred to dentists trying to increase the range of their services offered and increase their productivity, this trend will increase the ability of dentists to meet any expected increase in demand.

The survey explored the availability of dental assistance in the clinic; most of the participants (84%) do not have dental assistance within their practice. Interestingly we found from multivariate analysis that there is no significant relation between the increasing productivity and the income of dentists with the availability of dental assistance, this might be related to two reasons; the absence of qualified dental assistance, and revenues might not be sufficient to offset increased expenses incurred by hiring dental assistance. This finding is in accordance with previous study in US (David, Larry, K., & John, 2009).

In comparison with hiring rate for dental assistance, there are more dentists (51%) who depend on receptionists to help them in arranging their practice. This might be referred to lower cost of hiring receptionist in comparison with hiring qualified dental assistance.

Exploring the availability of x-ray devices in dental practice, as a measure to increase the productivity of dentists and help them to deliver better and more professional services to their patients, the survey shows that 49% of the dentists do not have x-ray devices. This might be because dentists' cannot withstand the cost of x-ray device in their clinics, or it might reflect weak dentists' awareness about the importance of radiology in diagnosis and sound clinical practice. This might affect the quality of treatment thereby this situation have to be improved.

The availability of dental laboratories in the clinic enhances the productivity of the dental work and make prosthetic and laboratories works more efficient and readily available, but for unfortunately this trend is not recognized in our dentists' practices.

Exploring the dentists' motivation to advance their knowledge and skills by enrolling in specialty programs, the survey shows that 61% of participants are encouraged to participate in training program. This reflects the desire of the participants increase their competency to be able to attract more clients in a competitive market.

Summary of demand evaluation for dental services

Evaluating the strength of demand from different prospects reveals that demand is weak and cannot absorb the progressive increase in dentists' number. The demand for dental services in optimistic case is ranging from weak to moderate. In addition to that, the available dentists can increase their productivity to absorb more demand on dental care. The instable political and fragile economic situations necessitate establishing a balance between the supplies of dentists in relation to the demanding power of the people.

There are also some dental health needs for population that have to be taken into consideration, away from peoples' ability to buy these services, those can be controlled by prevention measures, such as fluoridation and the preventive care for children.

6.3 Dentists supply assessment

It is imperative to try to adjust dentists' number with the demand of population for dental services. The current dentist to population ratio is more than the desired ratio obtained with the WHO/FDI model. There is strong evidence that Jenin is facing a major oversupply of dentists.

According to the data derived from the PDA, in 2005 there were 126 dentists registered in Jenin dental association this number increased to 135 in 2006, increased to 142 in 2007 increased to 148 in 2008 increased to 157 in 2009 increased to 165 in 2010, this number grew to reach 177 dentists in 2011, Table (5.12); with a growth rate in last six years 6.76%. Considering the attrition rate of 3% in five years, then we have 160 active dentists in 2010 out of 165 registered dentists, this makes dentist to population ratio 1: 1712, this ratio is higher than the ratio proposed by WHO (1 dentists :5000 inhabitants), especially with such economic and political situation in Jenin district that would negatively affect the demand for dental services. When we compare the dentists to population ratio in Jenin (1: 1758) with Canada (1 : 1745) (The Canadian Dental Association, 2005), we can see that Jenin has more concentration of dentists despite the lower economic status of the district. This figure strongly supports suggestion of dentists oversupply.

There are two main sources of dentist supply; dentists graduated from outside of Palestine and those who graduated from Palestine; dentists graduated from foreign universities and most of those students graduated from former Soviet Union countries, while Egypt represents the biggest source graduating dentists from Arab countries, Table (5.1). AL Quds University and Arab American University in Jenin represent the local sources for dental graduates. However these universities are expanding their infrastructure to accept more students, and there are other universities planning to open a new dental faculties. This shows that universities are producing dentist without considering the needs of the Palestinian population. By detecting the main source of supply which is local universities we can control it with regulations.

82% of the participant dentists support the conclusion of dentist oversupply. In exploring the reasons for this, the participants attributed the problem to the following:

1- The availability of a university in the district besides the graduation from other national and international universities.
2- Absence of coordination between universities and market needs and weak national planning of human resources.
3- Unregulated increase in universities intake of students, and the increased number of students enrolling to this area either from international or national universities.
4- The socio-cultural norms and values of the Palestinian society towards the medical profession, makes families direct their children to this profession with unclear orientation.

6.4 Projecting dentists number in 2015

In the absence of clear oral health strategy, we assume that the behavior of dentists within their profession will not change. In this situation the same patterns of inflow and outflow of dentists will be observed. The annual number of new dentists entering the market will be equal to the number of new graduates from local and foreign universities minus the attrition rate. This number can be calculated graphically using a linear regression of the

evolution of the number of dentists during the last 5 years (Figure 5.25). The results of this forecast shown in Table (5.12), shows that the number of dentists by year 2015 will be 198 after subtracting attrition rate, assuming the stability of patterns observed, and hence an oversupply of more than 33 dentists, with a dentist to population ratio of 1: 1799.

Another way which may help to project dentists' number is exploring prospective dentists who shall be graduated in coming fourth years from local universities; according to AAUJ there will be 28 dentists graduated from Jenin area in 2015, and accordance to Al Quds University there will be 15 dentists from Jenin in 2015, this represents 43 dentists. Considering number of dentists graduated from local sources alone the estimated number for dentists in 2015 will reach 220 dentists which are even more than projected number using regression line analysis, this point out clearly the high production rate of dentists from local universities.

6.5 Estimated requirements for dentists

Two approaches were considered to estimate needed dentists' number.

6.5.1 Population to dentists' ratio:

We adopt here the ratio recommended by WHO which is one dentist for each 5000 inhabitant, as it is noticed in Table (5.12), in 2005 according to WHO recommended ratio we need 48 dentists while we have 126 dentists. The number of existing dentists is far away more than recommended ratio for each year from 2005 till 2015 as in Table (5.12).
The projected dentists' number in 2015 is around 204 dentists, taking in account the expected growth rate of population in 2015 and according to WHO recommended ratio there shall be a need for just 71 dentists. The differences between needed dentists number and estimated number are obvious and it clearly indicates dentists oversupply.

6.5.2 Health needs service approaches:

In this approach, we will plan for the needed number of dentists working with MoH to deliver primary and preventive dental services to children till 14 years, full coverage of children aged till 14 years is mandatory for the improvement of the oral health of the population. Demand for dental services of 100% for the age cohorts 0–14 years is considered to be maximal demand and an objective to be reached. This percentage is recommended by WHO and FDI for developing countries (WHO /FDI, 1989). In order to achieve this objective and reach the desired ratio, there will be a need for 18 dentists to perform the 41 522 of dental working hours in 2010. Applying two scenarios of a (20% underestimation and a 20% overestimation of annual working time), there would be a need for 15 dentists to perform 33 217.6 of dental working hours in 2010, or 22 dentists to perform 49 826.4 of dental working hours in 2010.

6.6 The effects of dentists oversupply

Although some may believe that an oversupply of dentists may benefit the public by delivering better services at lower prices in a free market (Mann, 1993), this assumption was tested by in a very rigorous study, which analyzed the impact that several systems had in the levels of oral health in eight different countries. According to this study which analyzed how availability, accessibility and acceptance of dental systems influenced on the dental health of the studied populations. The study summarizes that “differences observed in the levels of oral health and non-covered needs of treatment were not associated with the limitations in the number and distribution of dentists, but maybe with other factors which influenced the system”. Therefore the hypothesis initially brought up, which suggested that an increase in the number of dentists would be translated into an improvement of the oral health status and a decrease of treatment needs, was not corroborated by the data obtained in the study (Chen M, 1997). Also the previous assumption won't be considered sound even from economic analysis point of view because the assumption of free market not applicable in health sector.

The imbalance in dental workforce can lead to undesirable consequences at the professional, economic, health and social levels (Bankowski & Meija, 1986). Dentists oversupply may adversely affect conditions of practice and patterns of work. Dentists may experience unemployment, underemployment or reduced opportunities for employment. Dentists can experience a drop in their real income. There may be increasing competition between professionals. The quality of care may deteriorate, as it has been already studied medium life of a filling: "it diminishes when the income of the dentists diminishes" (Colombet, Bourgeois, & Vandeputte.1996).

There could even be a threat to ethical principles, for example if there is a temptation to over-treat patients, introduce unnecessary services or fail to refer when indicated (Bankowski & Meija, 1986). The imbalance in dental manpower seems to be an international issue. The oversupply of dentists has been a major concern in various industrialized countries for the last decade and several studies on dental manpower planning have been published. Dental schools in North America reduced class sizes due to a perceived oversupply of dentists (Stangel, 1992). The oversupply of dentists in America has been described in many publications (Goodman; Weyant, 1990), (Nash K. , 1991), (Douglass, 1990). Beagrie reported that Scandinavian countries have also reported severe underemployment and unemployment problems for dentists with a dentist to population ratio lower than 1:1000 (Beagrie, Dental manpower. An FDI/ WHO viewpoint, 1986).In contrast to developing countries, oral health in these countries has improved considerably (and dental caries decreased) during the previous decades. Some ideas to solve this problem have been suggested in the literature. Restricting the number of undergraduate students has been implemented in many countries (Nash K. , 1991), (Beagrie, Dental manpower. An FDI/ WHO viewpoint, 1986), (Stangel, 1992), (L'offre, 1998), for example In the UK, two dental schools stopped accepting new students in 1989 in order to achieve the 10% reduction in dentists production which was thought to be appropriate to obtain a supply and requirement balance (Chaudhry Z, 1988). Several dental schools were closed in USA and the number of new dental graduates fell to the 1960s level (Special Committee on the Future of Dentistry, 1984).

This solution might be proved to be insufficient in Jenin if it is not coupled with other measures. The oversupply can be controlled by reducing the inflow of graduates of foreign dental schools (House; Johnson ; Edwards, 1993). Mann et al. cited a number of solutions

that can help solving the problem of oversupply (Mann, 1993). Increasing demand for services might be the most convenient and reasonable approach. Financing dental services or the presence of a third party payment is an additional approach to increase demand on services. An improved geographical distribution of dentists might be considered as a short-term solution.

Because of the long training time of dentists and because repercussions of a decision arise 6 to 10 years after it has been taken, measures should be taken urgently in order to reduce the supply of dentists (Colombet; Bourgeois; Vandeputte, 1996).

6.7 Issues in dental workforce planning

As this study shows one of the key issues as the basic fault lies in the defective planning of the workforce and no projection or forecast for the future. Strategies are not developed taking into consideration what could happen in the future.

The biggest challenge is the need for dental health planners with relevant qualifications and training in public health dentistry. There is a serious lack of authentic and valid data for assessment of community demands, as well as the lack of an organized system for monitoring oral health care services need to guide planners.

Human resource planning and utilization should be based on the aim for sustained development along with a system of monitoring and evaluation of programs. It is against this backdrop of change and uncertainty on the demand side of the market that the assessment of future dental workforce strategies must be developed. These strategies are further complicated by the multiple factors on the supply side of the market that will affect the capacity to provide dental services. Thus both demand and supply influence the ability of the dental workforce to adequately and efficiently provide dental care to Jenin population growing in size and diversity.

Since there are no dentists in government decision-making bodies, dentistry is at the mercy of medical professionals who usually take for their own profession the major share in the meager amount sanctioned by the government. Also, unless we develop dental health planners, growth will be haphazard, which is equivalent to no growth. Thus it is essential to have a group who has adequate foresight to project the workforce requirements in the future.

Another important challenge is to produce a high-quality workforce for future generations. Due to widespread of what is called commercial education, dental education has become a business, and this might cause ethical core of the profession to be declined.
Various reasons have been cited as to why the workforce should have its own code of ethics such as the unprecedented growth in some specialties, the mushrooming of continuing education courses, and the maintenance of their standards.

Also, well-qualified and high caliber students should be encouraged to enter the profession. Many of the students entering the dental schools have taken admission simply because they wanted a dental education, not unlike the dentists who preceded them.
The unprecedented mass of students entering the dental schools over the years represents a bulge in the enrolment trends. And when they begin to graduate, they find the world of dentistry moving at an increasingly competitive clip.

The world is changing at enormous speed. The workforce should be able to keep pace with the fast changing society so that it is not left behind in its service and is able to cope with the desires of the society. The goal of the workforce should be based on a commitment to prevention. Health education and the development of an effective health care system with proper communication are a must.

6.8 Conclusion

The main challenge and the root of all the issues facing the dental profession in Jenin district is to provide adequate, respectable, and attractive employment opportunities to the dental workforce while maintaining a balance between the needs and the demand power of population for dental services.

Based on the study and analysis of the utilization and demand power of population for dental services from different aspects, it found that the demand power was weak and cannot absorb current dentists' numbers. The disturbed balance is further aggravated by dentists oversupply this finding supported by two approaches to estimate needed dentists number. Both methods: dentist to population ratio and need/ service approach have shown that dentists supply is more needed than the number of dentists and according to projected

number of dentists in 2015, dentists oversupply is expected to continue. The dentists oversupply will lead to unsatisfactory employment opportunities in various areas and negative consequences on this profession on first hand, and it cannot support better dental services on the second hand.

6.9 Recommendations

The most important issue in planning for dentists' workforce is to develop strategies which help us to retain supply of dentists with population level demand for their services.
The following recommendations are offered by researcher and participants dentists to different stakeholder who can influence the balance between supply and demand for dental services:

6.6.1 Recommendation for decision maker:

1. Planning for dentists supply in accordance with population needs and demand and establishment of monitoring and evaluation system to help in better formulating appropriate policies and strategies to improve the oral health of Jenin population.
2. Improve cooperation and coordination between key stakeholders; Ministry of Health, Ministry of Education, universities, and the PDA.
3. Establish controls and limits to dental education from national and foreign country.
4. Fragmentation of delivered dental services to different specialty may help in increasing proficiency and regulate and distribute dentists supply. So it is wise to direct universities to post graduation study and specialty programs.
5. Consider directing qualified dentists surplus to outside markets and support unemployed dentists to find suitable work opportunities. This would help to support national economy and will enhance local market situation.
6. Training well qualified dental auxiliaries (dental hygienists, dental assistance) will consume fewer resources and can meet people's needs.
7. Considering financing dental services within the available insurances schemes, will increase the utilization for dentists’ services, as the financial issues had been found to be main barrier limits population demand for dental services.

6.6.2 Recommendation to PDA members:

1. Establishing regulation mechanism for licensing new dentists in accordance with the level of population demand.
2. Distributing dentists' clinics to underserved area and prevents opening more than one dental clinic by same dentists.
3. Encouraging PDA members to advance their productivity and proficiency to deliver better competitive services, as one of interesting findings of this study is that the available dental workforce has a great capacity to develop their proficiency.
4. PDA members, the dentists, should promote modern dental services and improve cultural and behavioral pattern of the population toward dental care, this should raise the population awareness about the importance of dental care and enhance the level of demand.

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Annexes

Annex (1): Study questionnaire (Arabic version)

جامعة القدس ابو ديس

كلية الصحة العامة

برنامج ماجستير الإدارة والسياسات الصحية

الطبيب/ة .... المحترم/ة

تحية طيبة وبعد

يقوم الباحث وبالتعاون مع نقابة اطباء الاسنان فرع جنين بعمل دراسة بعنوان (تقييم العرض والطلب على خدمات أطباء الأسنان في محافظة جنين) وذالك بهدف استكمال متطلبات الحصول على درجة الماجستير في كلية الصحة العامة في جامعة القدس حيث أن هذه الدراسة ستساعدنا في حساب اعداد اطباء الاسنان والتنبؤ بحجم النمو فى هذا القطاع بالمقارنة مع حجم الطلب من عامة الناس للخدمات السنيه وتحديد اذا ما كان هناك فائض أو نقص في اعداد الاطباء والحاجه المستقبليه لاعداد المزيد من الاطباء في منطقة جنين.

أرجو من حضرتكم التكرم بوضع اشارة (×) في المربع الذي ينسجم مع رايكم الشخصي، علما بان هذه البيانات ستعامل بسرية تامة ولن تستخدم الا لاغراض البحث العلمي فقط.

الباحث

محمود ناجي الحمدان

البيانات الأولية :

I. *الجنس* :

1- ذكر ☐. 2- انثى ☐.

II. *مكان السكن* :

1 – مدينة☐. 2- قرية ☐. 3- مخيم ☐.

III. *مكان العمل* :

1 – مدينة☐. 2- قرية ☐. 3- مخيم ☐.

IV. *الرجاء كتابة إسم بلد التخرج ونوع الإختصاص إن وجد*:

.....

الرجاء وضع إشارة (×) في المربع الذي ينسجم ورأيك الشخصي:

1) كم سنة امضيت في مزاولة المهنه؟

1- أقل من (5) سنوات☐. 2- (5-10) سنوات☐. 3- (11-15)سنوات☐. 4 – أكثر من (15) سنة☐.

2) ما هو معدل زيارات المرضى أسبوعيا ؟

1- أقل من(10) ☐. 2- (10-20) ☐. 3- (21- 30) ☐.

4- (31-40) ☐. 5- (41-50) ☐. 6- أكثر من (50) ☐.

3) باعتقادي كطبيب أسنان أن إقبال المرضى وكثرة ترددهم لتلقي المعالجة السنية:

1- ضعيف☐. 2- متوسط☐. 3- عال☐. 4- لا أدري☐.

4) كم مريض تستطيع أن تعالج أسبوعيا زيادة على المرضى الذين تعالجهم؟

1-أقل من (10) ☐. 2- (10-20) ☐. 3- (21- 30) ☐. 4- أكثر من (30) ☐.

5) ما هو متوسط عدد ساعات العمل اليومي في العيادة ؟

1- أقل من أربع ساعات☐. 2- ستة ساعات☐. 3- ثمانية ساعات☐. 4- أكثر من ثمان ساعات☐.

6) ما هو عدد أيام العمل الأسبوعي؟

1- أقل من(3) ايام ☐. 2- (3-5) أيام☐. 3- (6-7) أيام☐.

7) متوسط الإجازة السنوية التي أقتطعتها خارج العمل:

1- أقل من (15) يوم☐. 2- (15-31) يوم☐. 3- (32-47) يوم☐.

4- أكثر من (47) يوم ☐.

8) الرجاء تحديد إجابة ما يلي: درجة إنشغالي كطبيب أسنان :

1 – غير مشغول وأريد المزيد من المرضى☐.

2 – لدي كفايتي من المرضى و عدد المرضى ينسجم مع قدرتي الإستيعابية ☐.

3 – أقدم الخدمة لجميع المرضى الذين يطلبون ذالك ولكن ذالك أعلى من قدرتي الإستيعابية☐.

4 – مشغول جدا ولا أستطيع تقديم الخدمة لمزيد من المرضى☐.

9) كم يقدر متوسط حجم الإنفاق السنوي بالمعدل العام للمريض الواحد من مرضاك في محافظة جنين على المعالجة السنية بالشيكل؟

1– أقل من (500) شيكل☐. 2– (501–1000) شيكل☐. 3–(1001–1500) شيكل☐.

4 – (1501–2000) شيكل☐. 5– أكثر من (2000) شيكل☐.

10) بإعتقادي كطبيب أسنان إن حجم انفاق المرضى في محافظة جنين على المعالجة السنية في السنة الواحده:

1 – جيد☐. 2– متوسط☐. 3– ضعيف☐. 4– لا أدري☐.

11) ما هو المعدل الإجمالي للدخل الصافي الشهري للعيادة بالشيكل ؟

1– أقل من (2000) شيكل☐. 2– (2000–4000) شيكل ☐. 3– (4001–6000) شيكل☐.

4– (6001–10000) شيكل ☐. 5– (10001– 15000) شيكل ☐. 6– أكثر من (15000) شيكل☐.

12) ما هي أكثر العلاجات التي يتكرر إحتياج المرضى لها وتؤثر على سلوكياتهم تجاه طلب العلاج؟

1– قلع الاسنان والجراحه الفمويه☐. 2– حشوات عصب☐. 3– تنظيف للجير وعلاج اللثة☐.

4– تركيبات سنية☐. 5– زراعة الاسنان☐. 6- العلاج التحفظي و التجميلي☐. 7- تقويم اللأسنان ☐.

13) كيف تصنف درجة وعي المرضى وإدراكهم لأهمية المعالجة السنية؟

1– وعي ضئيل☐. 2– وعي متوسط☐. 3– وعي عالي☐. 4– لا أدري☐.

14) أكثر الفئات من المرضى التي أقدم لها خدمة المعالجة السنية في عيادتي هم من:

1 - أهل المدينة☐. 2- أهل القرى☐. 3- العرب داخل الخط الأخضر☐.

4- المخيمات ☐. 5- لا أدري☐.

15) أكثر الفئات العمريه التي أقدم لها الخدمات السنيه في عيادتي هم من:

1- الأطفال دون 15 سنة ☐. 2- (15-30) سنة ☐. 3- (31 – 46) سنة ☐. 4- اكثر من 46 سنة ☐.

16) الأكثر طلبا على خدمات المعالجة السنية في عيادتي هم من :

1 - الرجال☐. 2- النساء ☐. 3- نسبة متوازنة من كلا الجنسين☐.

17) في ظل الأوضاع القائمة هل تشجع التوجه لنظام إختصاص في مزاولة المهنة ؟

1- نعم ☐. 2- لا☐. 3-لا أدري ☐.

الرجاء علل إجابتك : .....

وإن أجبت بنعم ما ه و التخصص اللذي تؤيد التوجه إليه: .....

18) كم وحدة علاجية (كرسي أسنان) في العياده؟

1- واحدة☐. 2- اثنتان☐. 3- أكثر من اثنتين☐.

19) هل يوجد في العيادة موظف/موظفة استقبال (سكرتيرة)؟

1- نعم☐. 2- لا☐.

20) هل يوجد في العيادة مساعد/مساعدة للطبيب؟

1- نعم☐. 2- لا☐.

21) هل يوجد في العيادة جهاز أشعه (per apical X- ray)؟

1- نعم☐. 2- لا☐.

22)هل يوجد في العيادة مختبر أسنان؟

1- نعم☐. 2- لا☐.

23) هل تعتقد أن هناك زيادة في أعداد أطباء الأسنان؟

1- نعم ☐. 2- لا ☐. 3- لا أدري ☐.

إذا أجبت بنعم مع اعتقادك بأنها تمثل مشكلة ما هي أسباب المشكلة و ماهي إقتراحاتك للتغلب على هذه الحالة ؟

الأسباب: 1- _____

2- _____

3- _____

الإقتراحات: 1- _____

2 - _____

3 - _____

شاكرين لكم حسن تعاونكم

Annex (2): Study questionnaire (English version)

School of Public Health

Master Program

Management and Health Policy

Dear dentist:

Greetings

The researcher, in collaboration with the Palestinian Dental association - Jenin Branch conducted a study entitled (assessing of supply and demand for dentists in Jenin district), the spectrum of the aim of completing the requirements for obtaining a master's degree in the School of Public Health at the University of Jerusalem, where this study will help us to calculate the numbers of dentists and forecasting volume growth in this sector compared with the size of the demand of the public services and determine if there was a surplus or shortage in the preparation of future dentists and the need to prepare more dentists in the Jenin district.

I hope that you will kindly put signal (×) in the box that is in harmony with your personal opinion, note that these data will be treated confidentially and will only be used for the purposes of scientific research only.

Researcher

Mahmoud Naji AL-Hamdan

Initial data:

I. Dentist gender:

1- Male ☐. 2- Female ☐.

II. Place of residence:

1- City ☐. 2- Village ☐. 3- Camp ☐.

III. Place of work:

IV. City ☐. 2- Village ☐. 3- Camp ☐.

IV. Please write the name of the country of graduation and type of specialization, if any:

_____

_____

Please tick (×) in the box, which is consistent with your personal opinion:

1) How many years of experience?

1- Less than (5) year's ☐. 2 - (5-10 years) ☐. 3 - (11-15) year's ☐.

4- More than (15) years ☐.

2) Average of patients visits per week?

1-Less than (10) ☐. 2- (10-20) ☐. 3- (21-30) ☐. 4- (31-40) ☐.

5- (41-50) ☐. 6- More than (50) ☐.

3) I think that patient demand for dental treatment is:

1- Poor ☐. 2- Average ☐. 3- High ☐. 4- I do not know ☐.

4) How many patients you can treat more weekly?

1 - less than (10) ☐. 2 - (10-20) ☐. 3 - (21 - 30) ☐. 4 - More than (30) ☐.

5) Average of daily working hours:

1 - Less than four hour's ☐. 2 - Six hours ☐. 3 - Eight hours ☐.

3- More than eight hour ☐.

6) Average of weekly working days?

1- Less than (3) day's ☐. 2- (3-5) day's ☐. 3 - (6-7) day's ☐.

7) Average annual vocation days outside of work:

1 - less than (15) day's ☐. 2 – (15-31) ☐. 3 – (32-47) ☐.

4 - More than (47) ☐.

8) Please select an answer as follows: grade

1- I' am not busy and I want more patient's ☐.

2 - I have enough patients and the number of patients is consistent with my ability to absorb ☐.

3 – I deliver services to all my patients who but that's higher than my ability absorptive ☐

4- Very busy and I cannot provide service to more patients ☐.

9) The average of patients' expenditure on dental treatments on one year?

1 - less than (500) NIS ☐. 2 - (501-1000) of NIS ☐. 3 - (1001-1500) NIS ☐.

4- (1501-2000) NIS ☐. 5- More than (2000) NIS ☐.

10) As a dentist, what is your opinion on patients' expenditure on dental services:

1- Good ☐. 2- Average ☐. 3- Poor ☐. 4- I do not know ☐.

11) What is the overall rate of net monthly income of your clinic?

1 - less than (2000) NIS ☐. 2 - (2000-4000) NIS ☐. 3 - (4001-6000) NIS ☐.

4 - (6001-10000) NIS ☐. 5 - (10001-15000) NIS ☐. 6 - More than (15000) NIS ☐.

12) What are the most repeated treatments that patients need them and affect their behavior to seek treatment?

1 - Tooth extraction and oral surgery ☐. 2 - RCT ☐. 3 - Periodontology ☐.

4 - Orthodontics ☐. 5 - Dental Implant ☐.

6 - Conservative treatment & Cosmetic dentistry☐. 7- Prosthodontics ☐.

13) How would you range patients' awareness to the importance of dental treatment?

1 - Little awareness ☐. 2 - Average awareness ☐. 3 - High Awareness -☐.

4 - I don't know ☐.

14) Most of my patients coming from:

1 - People of the city ☐. 2 - The people of the village's ☐.

3 - Arabs inside the 1948 areas ☐. 4- Camps ☐. 5- I do not know ☐.

15) Most of my patients from age:

1 - Children under 15 years old ☐. 2 - (15-30 years) ☐. 3 - (31-46 years) ☐.

4 - More than 46 years old ☐.

16) Most of my patients are:

1- Men ☐. 2- Women ☐. 3- A balanced ratio of both sexes ☐.

17) Are you encouraged to attach specialty program?

1- Yes ☐. 2 - No ☐. 3 - I do not know ☐.

Please give reasons: _____

And if you answered yes, what field of specialty you recommend: _____

_____

18) How many dental unit (dental chair) in the clinic?

1- One ☐. 2 - Two ☐. 3 - More than two ☐.

19) Do you have receptionist (secretary)?

1- Yes ☐. 2- No ☐.

20) Do you have dental assistant?

1- Yes ☐. 2 - No ☐.

21) Is there is x-ray device in your clinic (per apical X-ray)?

1- Yes ☐. 2- No ☐.

22) Is there a dental laboratory in your clinic?

1- Yes ☐. 2- No ☐.

23) Do you think that there is an increase in dentists' number?

1 - Yes ☐. 2 - No ☐. 3 - I do not know ☐.

24) If you answered yes, what you think the reasons for the problem and solutions to overcome this situation?

Reasons: 1-_____

2-_____

3-_____

Suggestions: 1- _____

2-_____

3- _____

Thank you for your cooperation

Annex (3): Model 1, regression analysis

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	24.016	7	3.431	8.634	.000[a]
Residual	34.573	87	.397		
Total	58.589	94			

a. Predictors: (Constant), Average of net monthly income for your dental clinic, Dentist place of work, Sex of dentists, Number of dental units at your dental clinic, Years of practicing dentistry, Average of daily working hours at dental clinic, Average of patients visit to dental clinic

b. Dependent Variable: Busyness index for dentists

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	.291	.509		.571	.570
Dentists gender	.150	.150	.090	1.001	.320
Dentist place of work	.105	.182	.051	.577	.565
Years of practicing dentistry	.270	.073	.346	3.707	.000
Average of patients visit to dental clinic	.164	.058	.285	2.807	.006
Average of daily working hours in dental clinic	-.207-	.082	-.239-	-2.516-	.014
Number of dental units in dentists clinic	.182	.147	.114	1.238	.219
Average of net monthly income of dentists	.119	.068	.202	1.741	.085

a. Dependent Variable: Busyness index for dentists

Annex (4): Model 2, regression analysis

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	83.819	6	13.970	14.406	.000[a]
	Residual	85.338	88	.970		
	Total	169.158	94			

a. Predictors: (Constant), Number of dental units at your dental clinic, Average of daily working hours at dental clinic, Years of practicing dentistry, Sex of dentists, Average of patients visit to dental clinic, Is there is dental assistance at your dental clinic

b. Dependent Variable: Average of net monthly income for your dental clinic

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.594-	1.032		-.576-	.566
Is there is dental assistance at your dental clinic	.123	.329	.034	.375	.708
Sex of dentists	-.361-	.232	-.127-	-1.559-	.123
Years of practicing dentistry	.272	.108	.205	2.521	.014
Average of patients visit to dental clinic	.345	.084	.352	4.093	.000
Average of daily working hours at dental clinic	.353	.121	.240	2.922	.004
Number of dental units at your dental clinic	.812	.240	.299	3.383	.001

a- Dependent Variable: Average of net monthly income for your dental clinic

Annex (5): List of Persons Shared the Questionnaire Preparation and Criticism.

Name	Title	Location
Dr. Moatasem Hamdan	Supervisor	Al Quds University
Dr. Mona Hmaid		Al Quds University
Dr. Shokree Kolab	Associated professor	Arab American University
Dr, Mahmoud Abu Zaid	lecturer	Al Quds Open University
Dr. Imad Al Ghool	PDA	Jenin

Annex (6): Jenin map