

Geographic Distribution of Patients Attending a Private Dental Institution

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Abstract:

Background: A little detail is known about the geographical catchment area of dental hospitals. With no previous literature of this kind, information on dental demographic, dental needs, dental providers and the distance from the closest dental institution is necessary to plan for effective delivery of public oral health services.

Objectives: To assess the geographical distribution of patients attending the institution to define the catchment zones and to investigate the changes in the pattern of geographic distribution of patients

Methodology: New patients visiting SDM College of Dental Sciences and Hospital in the randomly selected months of March and September in the calendar year 2012, 2013 and 2014 meeting the inclusion criteria were included in the sample. Demographic details along with their location of residence were recorded.

Results: A total of 13, 600 patients came from a distance up to 300 km out of which 95% of patients came from within a distance of 100kms with the majority travelling a distance of 6-10.9kms in March and September of 2012, 2013 and 2014

Conclusion: The dental hospital has a fairly large catchment zone covering a distance up to 100kms from which 95 % patients reported overlapping those of private dental clinics.

Keywords: geographic distribution, geographic information system, GIS, density mapping, dental hospital, catchment area

I. Introduction

Hubli-Dharwad is the second largest urban agglomeration in Karnataka.¹ Large share of dental treatment is provided by both private clinics and dental institution. The latter serves as tertiary care centre in the field of oral care for a considerably large population.

There are many active charitable schemes for various dental ailments like Dant Bhagya for dentures and Smile Train for cleft lip and palate surgeries, which can be utilized by the general population. These schemes however need to be publicized in all the areas around the college, necessitates the need for gathering data about inflow of various patients from different geographical areas.

Little detail is known about the geographical catchment areas of dental hospitals, information on local demographics, which is necessary to plan for the effective delivery of public oral health services, data regarding that can be obtained using geographic information systems

A **geographic information system** (or **GIS**) is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographical data.²

Geographic Information Systems (GIS) are computer based systems for the input, storage, maintenance, management, retrieval, analysis and output of location based information. By illustrating juxtaposed multiple layers of information, GIS is emerging as an important novel tool in healthcare planning and understanding disparities locally, regionally, and nationally.^{3,4,5,6} Internationally, GIS is now used in a variety of public health and social science applications.⁷

With no previous studies done, little detail is known about the geographical catchment areas of dental hospitals, information on local demographics, to plan for the effective delivery of public oral health services. Hence the need arises to study the **geographic distribution** of patients attending the institution from surrounding villages towns and districts.

The present study aims at: 1) To assess the geographical distribution of patients attending the institution to define the catchment zones. 2) To investigate the changes in the pattern of geographic distribution of patients

II. Material and Methodology

Study design:

Cross-sectional Descriptive study

Study area:

The present study was carried out in S.D.M college of dental sciences and Hospital, Dharwad, Karnataka, India

It is located 425 kilometres North West of Bangalore, the capital of Karnataka state and it is administrative center of Dharwad district, with one private dental college hospital for the whole district.

Study population:

The study subjects comprised of adult population of 18 years and above who had visited S.D.M College of Dental Sciences and Hospital, Dharwad for treatment in the months of March and September in the year 2012 2013 2014

Sample size and sampling procedure:

All the patients who attended in the months of march and September 2012 , 2013, 2014 were included in the study

Study duration:

The study was conducted in the month of July-August 2015

Methodology:

To have a clear knowledge about the distance traveled by the patients, the months of March and September were selected randomly using the institutional database that records patient's demographics. All data used was kept discrete though unique patient identifier numbers which were retained to identify duplicate events (i.e. a patient having more than a single emergency dental event). Included in the study were the new patients (never visited the dental institution) visiting college for a dental checkup followed by minor/major treatment, in the calendar year of 2012, 2013 and 2014. The details included the name, age, gender, residential address and location of the patient.

The address for each patient in the sample was entered into a database and the longitude and latitude of each address obtained through a free access geocoding system (Google Maps API). The accuracy level of this geocoding was used as a measure of integrity of the data. Only addresses geocoded to the "address" or "premise" level of accuracy were included in the analysis. Using this free access geographic information system the distance between the residence of patients and institution was recorded.

Patients with unknown residence address were also excluded (approximately 9% of the patients in March 2012, 3% in September 2013 and only 2% of the patients in September 2014).

Statistical Analysis:

The data was tabulated using Ms Excel. It underwent descriptive statistical analysis using SPSS version 20. Number and percentage were used to compute results on quantitative measurement to conclude the catchment areas and the change in the coverage area of the institution.

III. Results

A total of 13,600 new patients visited SDM College of Dental Sciences and Hospital in the month of March and September in the year 2012, 2013 and 2014. Although this study was designed to evaluate the access of residents of Hubli-Dharwad to SDM College of Dental Sciences, the high number of patients coming from outskirts of Hubli-Dharwad and nearby cities dictated that our study area was enlarged, therefore the data comprised of distances up to 300kms. (Figure 1)

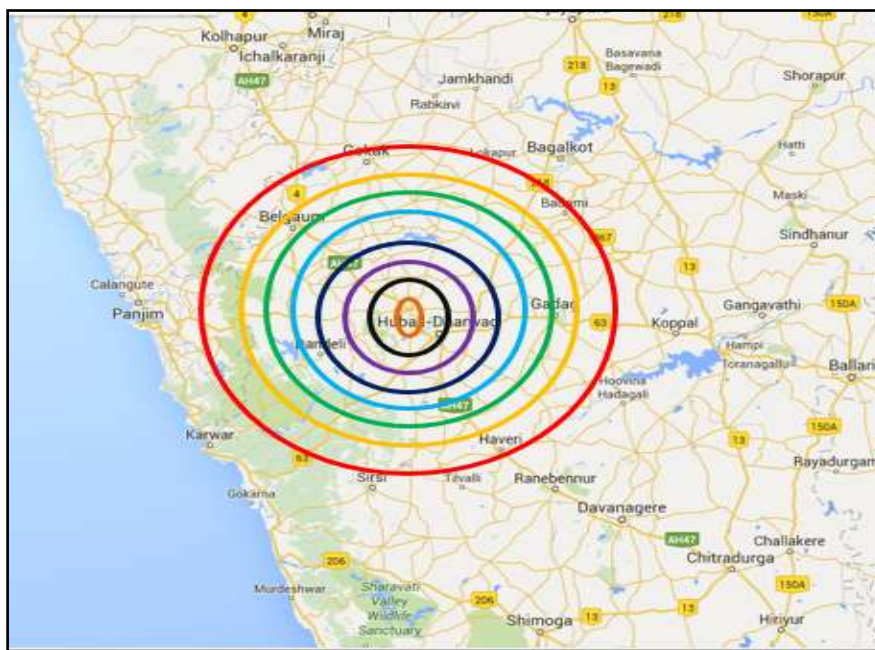


Figure 1 catchment area of the college

The analysis based on the age groups revealed that patients between the ages of 21-40 years traveled the most to avail treatment followed by patients in the age group of 41-60 years. (figure 2)

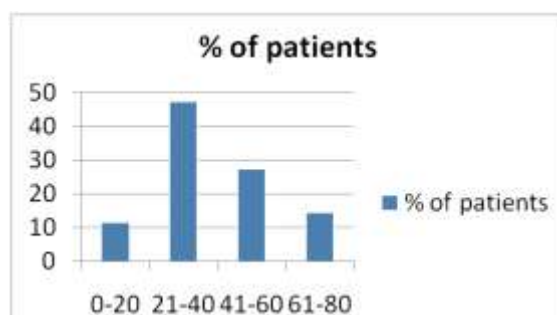


Figure 2 age wise distribution of patients

Access to treatment was analysed as a factor of straight-line distance from home address to SDM Dental College. The proportion of patients living in each of these concentric areas recorded.

The data analysis was based on distance from the college and age of patients receiving treatment at the institution. Age groups included are 0-20 years, 21-40 years, 41-60 years, 61-80 years & 80 and above.

Data Analysis:

In the month of March, maximum catchment area recorded is up to 300kms. In March 2012, majority of patients came from the distance of 6-10.9kms i.e. 13.3% (age group of 21-40 years) and 8.1% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 9.7% (age group of 21-40 years) and 4.6% (age group of 41-60 years).

In March 2013, patients came from the distance of 6-10.9kms i.e. 18.7% (age group of 21-40 years) and 10.4% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 13.9% (age group of 21-40 years) and 5.2% (age group of 41-60 years)

In March 2014, patients came from the distance of 6-10.9kms i.e. 19.9% (age group of 21-40 years) and 11.6% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 10.6% (age group of 21-40 years) and 7.5% (age group of 41-60 years) (figure 3)

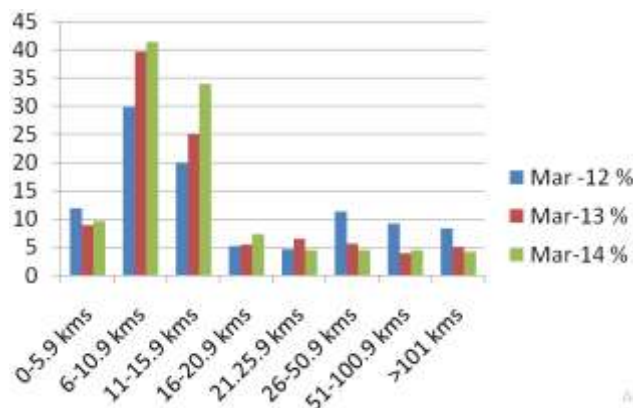


Figure 3 percentages of people attending from various distances from the college in march 2012, 2013, 2014

A similar result was obtained for the month of September. Maximum catchment area recorded is up to 300kms.

In September 2012, patients came from the distance of 6-10.9kms i.e. 19.8% (age group of 21-40 years) and 11.8% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 10.6% (age group of 21-40 years) and 7.5% (age group of 41-60 years)

In September 2013, patients came from the distance of 6-10.9kms i.e. 14.7% (age group of 21-40 years) and 10% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 10.1% (age group of 21-40 years) and 5.6% (age group of 41-60 years)

In September 2014, patients came from the distance of 6-10.9kms i.e. 13.6% (age group of 21-40 years) and 15.9% (age group of 41-60 years). This was followed by the catchment zone of 11-15.9kms, 8% (age group of 21-40 years) and 3.4% (age group of 41-60 years) (Figure 4)

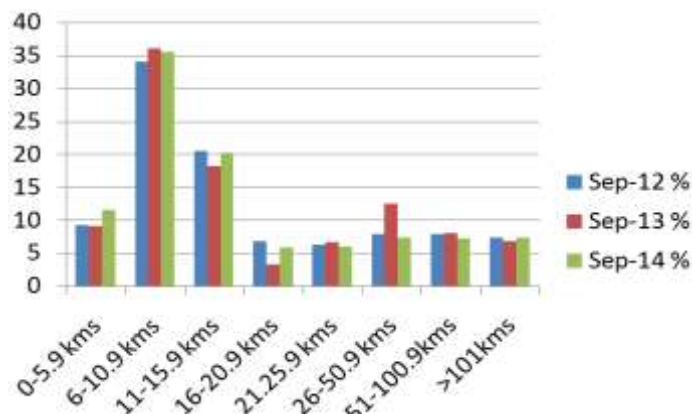


Figure 4 percentages of people attending from various distances from the college in march 2012, 2013, 2014

In March 2012 2013 and 2014 catchment area extended between 21-25.9 and 101 kms whereas in September 2014 the catchment area ranged between 16-25.9 kms from the location of the dental college (figure 5)

Figure 5 trends in catchment distances from the college

% of patients	Mar 2012	Mar 2013	Mar 2014	Sept 2012	Sept 2013	Sept 2014
Maximum(km)	6-10.9	6-10.9	6-10.9	6-10.9	6-10.9	6-10.9
Minimum(km)	21-25.9	51-100.9	>101	21-25.9	16-20.9	16-20.9

IV. Discussion

Dental disease is strongly linked to socio-economic factors, the more disadvantaged suffering greater burdens of disease.¹¹ SDM College of Dental Sciences and Hospital between Dharwad and Hubli is on the highway. Its close proximity to the nearby small villages like Sattur and purpose of a public dental hospital is to primarily provide care to the socio-economically disadvantaged population.

In our present study, 87% of the patients travel a distance up to 50 kms to avail dental treatment out of which, a vast majority comes from a radius of 6-10kms. In a study conducted in Australia a large share of 95% patients from a geographic area of 50kms with the majority coming from 15kms.¹² For our study, an argument can be mounted that a highly mixed community (where wealthy and poor live side-by-side) could account for

the lower level of deprivation for patients travelling smaller distances to the centre. Moreover, the SDMCDS also operates as a tertiary teaching facility with its central location. Additionally, the historical nature of the hospital would also influence the distribution of patients from the older (more geographically central populations) remaining patients of the hospital despite the changing nature of the community economics around them. A similar study conducted in private clinics in Melbourne 75 % of patients came from within a distance of 10kms.¹³ It was clear that the SDM's extensive catchment zone overlapped with the much smaller community clinics' zones. Also, the age distribution reveals that those demanding treatment mostly belonged to the age group of 21-40 years . A similar study was conducted in Pondicherry reported that patients avail treatment mostly belonged to the age group of 21-30 years in both the sexes. This can be due to the fact that ages of 21-40 come under working class of people who have a better access and require higher aesthetics compared to those in the older age groups.¹⁴

Despite a large catchment area, a huge chunk of the population is still not making use of the dental services provided by dental institutions. As discussed by Phibbs and Luft (1995) the correlation between travel time and straight-line distance is high in most of the cases, though less well correlated for shorter distances and in dense urban areas with high traffic congestion and reliance on surface roads.¹⁵ An assumption can be made that the influence of transport options in the choice of emergency dental service needs to be better explored. Further studies should look not only at costs but availability of public transport as a barrier to accessing dental care.

Dental disease is a serious public health problem with universal distribution and affecting all age groups. However, despite this universal distribution, only a few seek dental care. Thus a wide gap is created between the actual dental needs of the population and the demand for dental care which is quite understandable from the cited literature. In India, people encounter various obstacles in utilization of dental services. These barriers can be removed by motivating people and making them aware about the oral health problems that remove anxiety and fear so that they develop positive attitude towards dental treatment. It is suggested that mobile dental clinics, dental camps, and dental outreach programs could be solutions to spread awareness and disseminate treatment. There is a need for reasonably priced, rural oral health centers to make dental care available to rural strata of the population. Unmet treatment needs of the people belonging to lower class should be addressed during conduction of dental programs. The study thus helps to choose the areas where more emphasis has to be laid in conducting programmes in the future.

V. Conclusion

SDM College of Dental Sciences with its central location had a surprisingly large catchment zone stretching to near 100km overlapping the areas served by other community based public dental clinics from which 95% of patients reported. The study describes the geographic pattern of patient attendance and guides us to focus more attention through our outreach programmes to those areas from where fewer patients are reporting .This would be helpful for proper planning of the dental health care system at the national level with limited financial resources. Further studies however may be required to elucidate such factors

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