

Brief Report

**Prenatal oral health: geo-spatial analysis of access to care**Nirosha Ranasinghe^{1*}, Estie Kruger², Marc Tennant²¹ National Institute of Health Sciences (NIHS), Kalutara, Sri Lanka; ² International Research Collaborative – Oral Health and Equity, School of Human Sciences, The University of Western Australia, Australia

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Abstract

Introduction: Prenatal oral care is important for both the oral and general health of the woman and the offspring and it should be maintained throughout the life course.

Objectives: To determine the distribution of both hospital and community dental care facilities for the provision of oral healthcare to antenatal mothers referred to the maternal and child health (MCH) clinics, in the district of Gampaha, Sri Lanka

Methods: All the MCH clinics and all available public dental care facilities were mapped using Geographic Information System (GIS) software, and the minimum referral distance was measured from each MCH clinic to the nearest public dental clinic using the distance-based GIS tools.

Results: The referral distance reported from an MCH clinic to a public dental clinic varied between 0-8.5 km. About 22% (n=37) of the MCH clinics had an in-house or proximate dental facility not more than 1 km away. About 41% (n=69) of MCH clinics had a public dental clinic within a 2.5 km distance, and it increased up to 81% (n=136) when the referral distance expanded up to 5km. The average referral distance for pregnancy oral healthcare in the entire district was 3 km.

Conclusions: The study identified service disparities in pregnancy oral healthcare in the district using geo-spatial techniques. It could contribute to future planning of hospital and community based dental clinic locations for antenatal mothers, emphasising the importance of referral distance in improving the dental attendance among pregnant women.

Key words: *oral health, pregnancy, maternal and child health, GIS*

Introduction

Pregnancy is a physiological condition that place women at increased risk of both oral and systemic health (1). Oral diseases, particularly gum disease and untreated dental decay are the most common oral health problems experienced by mothers during pregnancy (2-4). The complex physical, physiological, behavioural and emotional changes in women during pregnancy may increase their susceptibility to oral diseases. Changes in the periodontium are well documented in 30-100% of pregnancies (2). The risk of dental caries and dental erosion may also increase during pregnancy due to changes in diet and oral hygiene practices.

Oral health plays an important role in overall health and wellbeing of pregnant women (5). Untreated periodontal infections during pregnancy can compromise the mothers' general health and foetal safety. Maternal periodontitis may bring about adverse pregnancy outcomes such as preterm birth, low birth weight, pre-eclampsia and gestational diabetes if left untreated (6-7). Poor oral health in adult women is also associated with chronic diseases such as cardiovascular disease and diabetes (8). The likelihood of developing dental caries in young children as a result of maternal untreated dental decay has been established by numerous studies conducted in the recent past (9-11).

Oral healthcare during pregnancy is now recommended in most of the developed nations (12). In the UK, free dental care is provided to all pregnant women under their National Health Service (13). A midwifery-initiated Oral Health Programme was also found to be effective in Australia (14). The current utilization of dental care services by pregnant women is generally low, internationally and also locally in Sri Lanka and linked to various barriers such as cost, poor access, poor resources, lack of awareness of its importance, myths and misperceptions, low socio-economic background and concerns on foetal safety (15-18). Despite existing recommendations to include oral health as a component of prenatal care, unmet dental treatment needs for a substantial number of low-income pregnant women still persist, with often years-long waiting lists for public dental

care while private dental care remains unaffordable (19).

According to the Practice Guidelines of Oral Healthcare in Pregnancy in Sri Lanka, all MCH clinics within a particular MOH area should be allocated to the closest government dental clinic for provision of compulsory oral health screening and necessary dental treatment (20). This plan aims to help all Sri Lankan mothers to prevent complications of dental disease during pregnancy, reduce adverse pregnancy outcomes and to decrease the potential of early childhood caries in her off-spring particularly during the first five years (20).

Maternal and child health care in Sri Lanka is provided mostly by the public sector hospitals along with field MCH clinics and to some extent by the private sector hospitals. Field MCH clinics are conducted under the administrative supervision of the MOH who is responsible for the primary health care services of his respective divisional health area. The medical officer in charge of MCH (MO-MCH) at the regional level, coordinates and supervises the MCH activities in the district. The oral healthcare services in the country are delivered by both the public and private sector. The public oral healthcare services for antenatal mothers are provided through a network of hospital dental clinics (HDC) situated in government hospitals along with preventive oriented adolescent dental clinics (ADC) and community dental clinics (CDC). A regional dental surgeon (RDS) at the district level coordinates and supervises the oral health services of the country at district level.

Evidence suggested that little collaboration exists between dental and MCH professionals in addressing women's oral-systemic health concerns (21). In Sri Lanka, a recent evaluation of the National Oral Healthcare Programme for antenatal mothers in the district of Gampaha found poor utilization of oral health care in pregnancy and also identified various perceptions of antenatal mothers about provision of oral health care during pregnancy (16, 22). The qualitative component of the same study involving MOH and dental surgeons, and regional officers of MCH (MO-MCH) and dental health (RDS) highlighted the additional barriers in antenatal and

oral healthcare settings in access to oral healthcare in pregnancy (17). According to national oral health reviews, the coverage of 'oral screening' of antenatal mothers in Sri Lanka were 36% and 41% during the year 2012 and 2013, respectively (23-24). An evaluation study revealed it was 27.8% in the district of Gampaha in year 2013 (16). A recent study further highlighted that apart from the written referral to the dental care facilities, prenatal care providers rarely addressed the oral health complaints made by the antenatal mothers (25).

In Sri Lanka, all MCH clinics are providing referrals to antenatal mothers essentially during their first and second trimesters to be screened by a government dental surgeon for any oral health risk and completed all necessary dental treatments before the effective date of delivery. For such referral services to be successful and effective, the dental care facilities should be available, adequate and accessible to the mothers. The present study uses the spatial analytic technique of GIS to further explore the issues of physical accessibility prevailing in district level for provision of timely oral healthcare for antenatal

mothers in Sri Lanka.

Methods

The study was a cross-sectional descriptive study on the geographic distribution of public dental facilities relative to all available MCH clinics in the district of Gampaha, Sri Lanka. This

district in the Western Province of Sri Lanka is 14000 km² in area, which is 2.1% of the total land area of the country. According to the last census, the total population of the district is 2.3 million (26).

The physical addresses of each MCH clinic and public dental clinic and the total population of registered pregnant mothers by public health midwives (PHM) in each MOH area were obtained from the database maintained at the Office of the Regional Director of Health Services (RDHS), Gampaha District, Sri Lanka. Geocoding of the MCH clinic locations and public dental clinics were completed using a free access, geo-coding website for Google maps, by which geographic coordinates

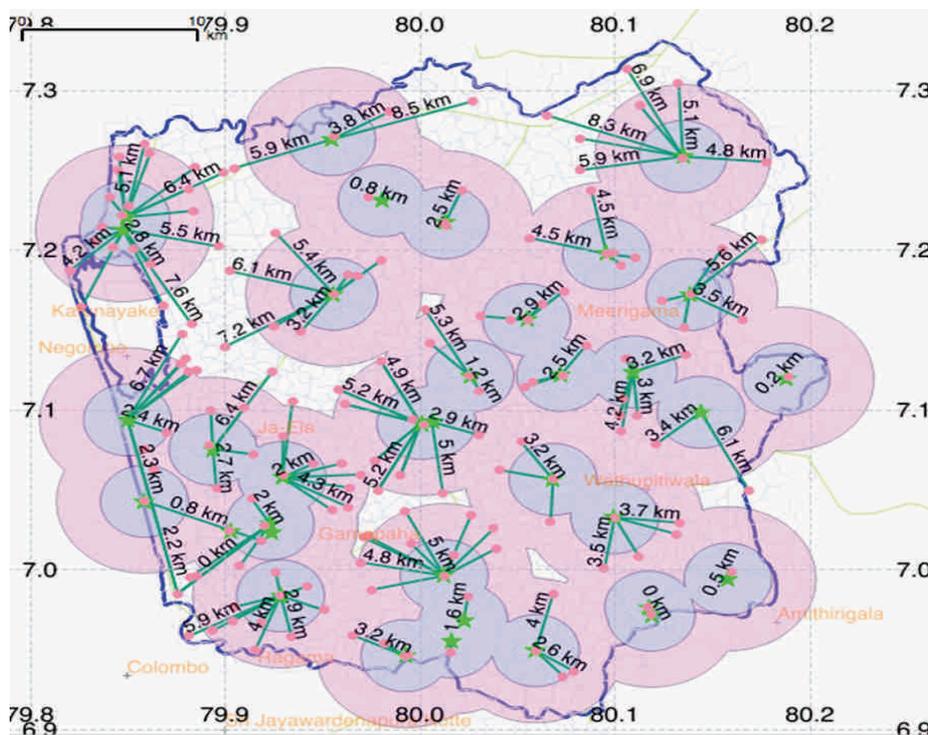


Figure 1: Map of Gampaha district showing 2.5 km (Blue) and 5 km (pink) buffers around dental clinic locations (Green stars) and the distance from each MCH clinic (pink dots) to the nearest public dental clinic in kilometers

(longitudes and latitudes) were collected for each physical address. All the recorded and cleaned database files were transferred into QGIS (version 2.14.1) for analysis. Using the GIS software, concentric buffers of 2.5 km and 5 km were constructed around each dental clinic location to identify the MCH clinics having dental care facilities within an acceptable distance. The distance from each MCH clinic to the nearest dental clinic was also measured using distance-based GIS tools and further descriptive analysis was completed.

Results

The total number of public dental practices and MCH clinics in the district of Gampaha were 36 and 178, respectively. All 36 dental clinics were geo-coded and 167 out of 178 (93%) MCH clinics could be geographically identified. The total population of registered antenatal mothers under care in MCH clinics in the district of Gampaha in 2012 was approximately 41,000 (Table 2). The study estimated that about 41.1% (n=69) of MCH clinics in the

Table 1: Number and percentage of MCH clinics having their nearest dental clinic at different distance levels

Referral Distance	From MCH clinic to the nearest public dental clinic in km				Total
	≤1.0	1.1 - 2.5	2.6 - 5.0	> 5.0	
Number of MCH clinics	37	32	67	31	167
Percentage	22.2%	19.2%	40.1%	18.6%	100%

Table 2: The average, minimum and maximum referral distance in each MOH area

MOH area	No. of pregnant mothers registered in MCH clinics	No. of MCH clinics	No. of dental clinics	No. of dental surgeons	Referral distance (km)		
					Minimum	Average	Maximum
Attanagalla	3324	16	6	8	0.0	2.2	6.1
Biyagama	3639	10	2	2	0.0	2.1	4.2
Divulapitiya	2559	13	3	3	0.0	4.0	8.5
Dompe	2796	15	6	6	0.0	1.7	4.0
Gampaha	3091	16	3	7	0.2	3.3	5.3
Ja-ela	2359	6	1	1	0.4	2.4	3.4
Katana	1986	5	0	0	3.9	5.0	6.4
Kelaniya	2391	7	1	2	0.0	3.2	5.9
Mahara	3495	13	2	2	0.0	3.1	5.3
Mirigama	2968	12	3	4	0.0	3.4	5.3
Minuwangoda	3029	17	1	1	0.0	2.7	6.9
Negombo	2691	14	2	6	0.2	2.7	5.9
Ragama	1264	4	4	1	0.2	0.8	2.0
Seeduwa	2649	11	0	0	4.1	5.8	7.6
Wattala	2928	8	2	2	0.0	2.5	5.3
All district	41169	167	36	45	0.0	3.0	8.5

district had a public dental clinic within a 2.5 km distance and it increased to 81.5% (n=136) at 5 km (Table 1, Figure 1). In-house dental facilities were available in most of the MCH clinics conducted in divisional hospitals (rural hospitals and peripheral units) and primary medical care units (PMCU) in the district, and where these in-house facilities were available, the minimum distance was recorded as '0'. The maximum distance reported was 8.5 km from the Divulapitiya MOH Area. The access to prenatal dental care was comparatively higher in the MOH areas of Ragama, Dompe, Biyagama, Attanagalla, Jaela and Wattala. The average referral distance they reported was less than 2.5 km. Pregnancy oral healthcare was challenging in MOH areas of Seeduwa and Katana, where there were no public dental clinics. The average referral distances reported were 5.8 km and 5.0 km respectively (Table 2).

Discussion

Currently, there are 178 functioning field MCH clinics that provide maternal and childcare, family planning and other preventive health services in the district of Gampaha. These services were provided by 487 field PHMs and 61 MOHs and additional MOHs (AMOH) in the district. The hospital dental services are provided through one teaching hospital, two district general hospitals (DGH), one base hospital (BH), 13 divisional hospitals and eight PMCUs. There were also two hospital dental clinics in Welisara Chest Hospital and Rehabilitation Unit, Ragama which were administratively supervised by the line ministry. In addition, there was a Mobile Dental Unit (Transport Service) in Gampaha District which provided comprehensive oral healthcare services for the entire district, particularly for antenatal mothers in some rural and remote settings. About 51 dental surgeons working in HDCs, ADCs and CDCs are responsible for the government dental services providing for antenatal mothers in the district of Gampaha. The average referral distance to obtain pregnancy-related oral healthcare in the district was 3 kms, and the maximum reported distance was 8.5 kms. The district of Gampaha is considered the second wealthiest district in the country, based on the poverty head count index data of 2012/2013 (27). Therefore, the service disparities

and inaccessibility to care may be more adverse in the other poverty-stricken districts of the country, where the antenatal oral healthcare programmes are in place.

About 22% (n=37) of the MCH clinics in the district had an in-house or proximate dental facility not more than 1 km away, which makes the referral more convenient to the mother, as well as to the MCH care provider (Table 1). The referral would not be easy however, for 19% (n=31) of MCH clinics where the dental facility was located far beyond a 5 km distance (Table 1; Figure 1). Hence, the clinic attendees are more likely to neglect their 'pregnancy oral screening' and necessary dental treatments that should be completed during pregnancy. Motivation will also be poor among the public health staff to write a timely referral to a dental clinic due to unavailability of such services in close proximity. The distance is a barrier for the proper coordination between MCH and oral healthcare provider, which is essential in dental management of pregnant women, especially in some cases of medically compromised conditions for dental treatment. It has been reported that some dentists are reluctant to treat pregnant patients due to some litigation issues and lack of emergency management facilities in the isolated dental clinics, far away from medical services (17). Even though many countries adopted a strategy to promote oral health of mothers and their off-spring, a lack of emphasis by the MCH staff, and poor coordination between dental and medical providers makes it challenging to improve the screening and treatment services (1). Very little attention has been given to the issues raised by dental and medical care providers for deterring such care in pregnancy in poor resource-based settings (17). Very little is also known about the perceptions of mothers who received such care in pregnancy. A recent systematic review reported demographic, socioeconomic, psychological and behavioural factors, and perceived need as determinants of utilization of dental care during pregnancy and found the requisite of more well-designed studies to confirm the findings (28).

The study evaluated the distance-based feasibility of the pregnancy oral healthcare model implemented in Sri Lanka in the year 2009, which aimed to provide comprehensive oral healthcare to antenatal mothers

(20). It identified the service disparities in pregnancy oral healthcare in the district and identified the specific geographic areas that need high priority when establishing future community dental clinics. The referral distance marked a primary concern in inter-professional collaboration between dental and medical providers and maintaining inter-professional accreditation standards in dental management of pregnant patients on par with practice guidelines. Hence, it is important to manage the referral distance at a standard and acceptable limit when providing quality and safe oral healthcare for antenatal mothers.

Public Health Importance

- Many countries have adopted a strategy to promote oral health of mothers and their offspring. However, a lack of emphasis by the MCH staff, and poor coordination between dental and medical providers make it challenging to improve the referrals.
- The referral distance marked a primary concern in inter-professional collaboration between dental and medical providers and maintaining inter-professional accreditation standards in dental management of pregnant patients on par with the available practice guidelines.
- It is important to manage the referral distance at a standard and acceptable limit when providing quality and safe oral healthcare for antenatal mothers.

Author Declarations

Competing interests: The authors declare that they have no competing interests.

Ethics approval and consent to participate: Ethical approval was not necessary for this study since the data used was open access and available for public access. Prior permission was obtained from the regional health authorities to evaluate the prenatal oral healthcare services in the district.

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Author contributions: NR designed the research, executed the research, analysed the data, and wrote the manuscript. EK and MT were also involved in the analysis of data and revised the manuscript critically, and approved its final version.

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