

Full Length Research Paper

# A survey of Tuberculosis in the city of Maroua, Far North Region of Cameroon

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Accepted 05 July, 2016

**Tuberculosis is a public health challenge in cities. Its prevalence jeopardizes socio-economic and urban development, especially in sub-Saharan Africa where it is a major cause of illness and deaths mostly among the already vulnerable urban poor. The goal of this paper was to make a survey of active human tuberculosis in Maroua and suggest recommendations in order to tackle the disease. Detailed reconnaissance surveys, clinical sources of identified cases, interviews with relevant actors, cartographic analysis via GPS surveys and satellite-based GIS google earth image and the administration of questionnaires to sample the perception of the inhabitants revealed a high prevalence of TB in the town (7.33%). More cases were recorded among males (68.8%) than females (31.2%). TB prevalence was highest (65.9%) amongst the adult age group (15-45). The Missinguiléo neighbourhood recorded the greatest frequency (>21%) of TB cases (50%). There is a poor perception (27.9%) on the awareness of TB symptoms including HIV/AIDS by the inhabitants. The study suggests preventive measures that could be adopted to tackle the disease, improve the health of the inhabitants, increase investment in health care, life expectancy and literacy, reduce poverty and foster sustainable socio-economic and urban development which is one of the Cameroon's perspective since 2004 when it adopted Law No. 2004/3 of 21st April 2004 governing town planning, urban development and construction throughout the national territory.**

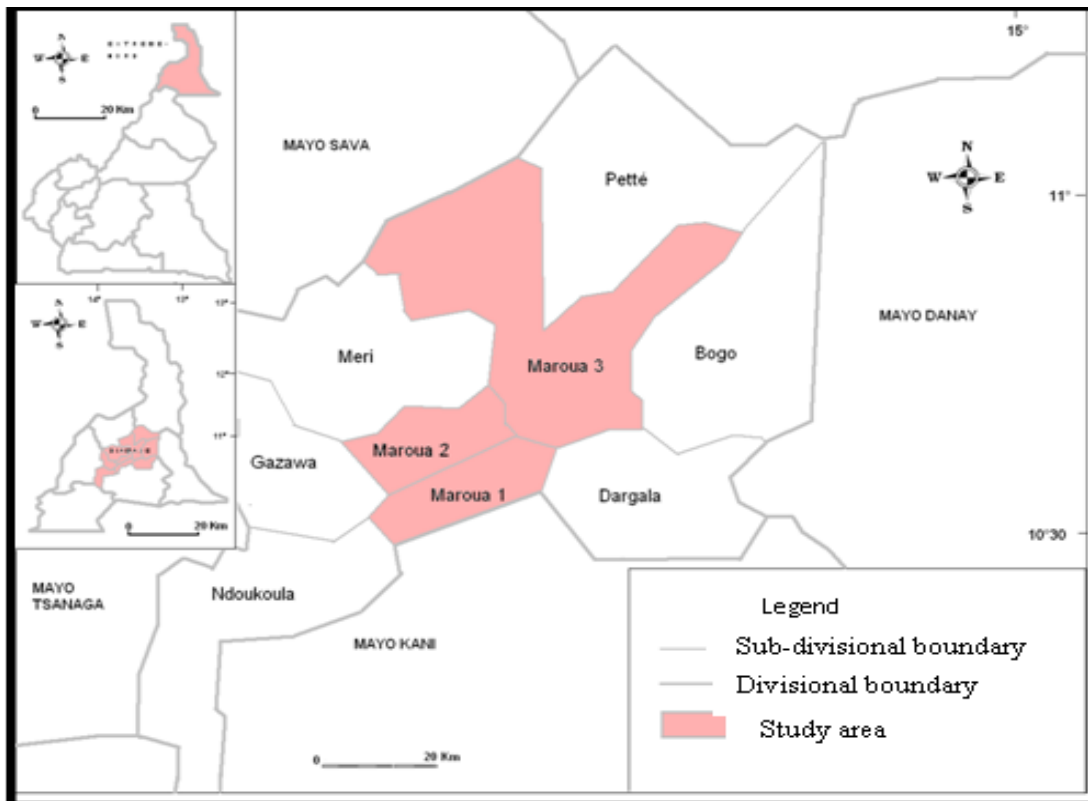
**Keywords:** Tuberculosis, urbanization, urban poor, prevalence, Maroua, Cameroon

## INTRODUCTION

Tuberculosis (TB) is a contagious respiratory infection caused by the *bacteria Mycobacterium tuberculosis* that can be transmitted from one person to another. TB wreaks havoc on a global scale. WHO (2014) estimates that annually, TB affects some 9 million people worldwide, out of which about 1.7 million die from the disease. The prevalence is especially high in poor and overpopulated areas in countries of Asia, Africa (including Cameroon) and South America. The significant morbidity (incidence or prevalence of any given disease, in this case TB) from TB pushed the UN to establish World TB Day on March 24, and WHO and other international organizations are stepping up the fight against tuberculosis. One third of the world's population is said to be infected with TB and 22 countries (most of which are in Africa) account for over 80% of the TB disease. Over the years, the incidence of the disease has been on an

increase. Waszkiewicz (2015) reports a massive increase of 81%, from more than 188 thousands cases in 2001 to more than 341 thousands cases in 2006. This situation is so serious that it jeopardizes the Millennium Development Goal of halting and beginning to reverse the spread of TB as one of the world's major diseases by the year 2015.

Cameroon is a country in sub-Saharan Africa with a high incidence of TB. In 2013, the value for incidence of TB (per 100,000 people) in the country was 235.00 and over the past 23 years, the value has been fluctuating between 321.00 in 2003 and 110.00 in 1990 (WHO Global Tuberculosis Report, 2013). Statistics from the National Programme for the Fight Against Tuberculosis in Cameroon indicate that since 2014, some 26,000 Cameroonians are diagnosed with the TB, and 40% of those suffering from TB are co-infected with the HIV



**Figure 1:** Location of Maroua in the Diamaré Division, Far North Region of Cameroon. Source: Maroua Urban

virus. Deaths resulting from TB reached 3,647 or 1.54% of total deaths in 2011 while the age adjusted Death Rate is 21.89/100,000 of population. In 2011, Cameroon was ranked 68<sup>th</sup> Most affected country with TB in the world, drastically dropping to 29<sup>th</sup> place in 2013 following therapeutic success by the national Tuberculosis Programme (NTP) which now has more than 216 centres for diagnostic and treatment throughout the national territory.

The study area (Maroua) is the administrative headquarters of the Far North Region of Cameroon, situated in the Diamaré Division. It is one of the oldest of the 312 towns in the country recorded by the Central Bureau for Census and Population Studies-BUCREP (2010). Maroua is located between Latitude 10° and 11°N and Longitude 13° and 15°E. The Maroua Municipality covers a surface area of 127km<sup>2</sup> and is composed of 3 council areas (Maroua 1-Domayo, Maroua 2-Doualaré and Maroua 3-Dougoui). Maroua is bounded to the north by the Logone and Chari and Mayo Sava, to the south by Mayo Kani, to the east by Mayo Danay and to the west by Mayo Tsanaga Divisions (Fig. 1). The town's population is cosmopolitan and fast increasing. By the year 2011, the town's population stood at over 337,719 inhabitants distributed within the 3 council areas as follows: Maroua 1 (101,800), Maroua 2 (124119) and

Maroua 3 (111,800). As of 2015 its population stood at over 400,000 inhabitants. In Cameroon according to law, any agglomeration with 5000 inhabitants is a town or city. TB quickly replicates amongst such a large urban population as is the case in Maroua.

The main problem stems from the high prevalence of TB in the city resulting to deaths. The Commission on Macroeconomics and Health (CMH) cited in Vassall (2009) reports that TB contributes substantially to mortality and morbidity of the world's poorest. This is particularly true among the adult population of developing countries in general. The occurrence of TB in Maroua is ubiquitous and cosmopolitan making its control cumbersome leading to many deaths. In his message on World TB day of 2005, the former UN Sectary General-Koffi Annan cited in Gotera *et al.*, (2005) echoes that five thousand people die from tuberculosis every day. Even though the treatment of TB is free in Cameroon, many people still die of TB in Maroua due to ignorance.

Deaths resulting from TB are high in developing countries because TB co-exists with other deadly diseases like HIV/AIDS (which impairs immune system that makes the body able to fight diseases). This is rapidly increasing the severity of the TB epidemic particularly in sub-Saharan Africa (Vassals, 2009). This justifies why TB is the leading cause of death of people

with HIV. The Core Group (2013) reports that in 2010, 13% of all TB deaths were in people who were HIV infected. According WHO/UNAIDS (2004) cited in Noeske *et al.*, (2006), 5.5% (4.8-9.8%) of sexually active adults (15-49 years old) in Cameroon are living with HIV/AIDS and easily die from TB. Poverty is a propelling factor of TB in low income countries. Many poor people die of TB everyday as TB ravages mostly the poor in society who are suffering from yet another burden of poverty. In Maroua, we find the poorest of the poor who are susceptible to contract TB. Seventy five percent of the population of the Diamaré Division in general lives in absolute poverty (Wanie and Watang, 2013). As a result of unemployment, deprivation and low level of educational attainment, many youths seek pleasurable life in the streets some of whom end up in the web of unwanted pregnancies, STDs including HIV/AIDS and TB.

Vassal (2009) opines that the highly recommended WHO strategy in controlling TB-Directly Observed Treatment, short-course (DOTS) is only available to around half the world's population and thus there remains a considerable mountain to climb to ensure global access to effective TB treatment. So far, Cameroon's led TB control programme in Maroua is limited only to the Regional Hospital, and so is highly centralized. The workforce for the fight against TB in the Hospital is also weak consisting of few workers who share responsibility, and are inadequate and poorly equipped further exacerbating the situation. Perufa-Yone *et al.*, (2014) highlights that in developing countries, insufficient resources are a deterrent to routine testing of the susceptibility of Mycobacterium tuberculosis to anti-tuberculosis drugs prior to the treatment. Most of the TB patients are stigmatized, and their esteem has been lost both in households and within the community. The Core Group (2013) highlights that people with TB often suffer in addition to illness from insults, rejection, isolation, food deprivation and cast out from their homes. Others become alcoholic and addicted to smoking, causing treatment ineffective.

Data on TB prevalence in urban areas (cities) in Cameroon is lacking or non-existent. This far, the bulk of publications on TB in the country focuses on population dynamics of Tuberculous bacilli (Koro Koro *et al.*, 2012) and TB control (Keugoung *et al.*, 2013). Others include non-conversion of sputum smears in new smear positive Pulmonary Tuberculosis (PTB) patients (Kuban *et al.*, 2009; pefura-Yone *et al.*, 2014; Noeske *et al.*, 2004), PTB in prisons (Noeske *et al.*, 2006; 2011), and prevalence of Bovine TB (BTB) in abattoirs (Awah-Ndukum *et al.*, 2010; 2005). Also, seasonal variation and prevalence of TB (Ane-Anyangwe *et al.*, 2006), genetic biodiversity of Mycobacterium tuberculosis TB complex strains from patients with PTB (Niobe-Eyangoh *et al.*, 2003; Brudey *et al.*, 2006), and parameter estimation based synchronization (Bowong and Kurths, 2010) have also

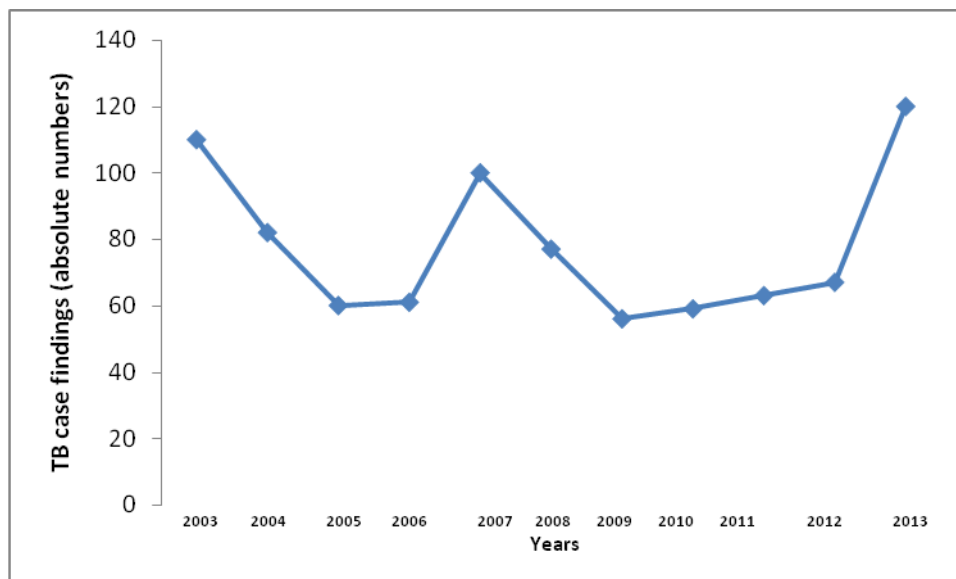
been treated. Other works centre on incidence, time and determinants of treatment defaults (Pefura-Yone *et al.*, 2011), acquired anti-TB drugs resistance and risk factors to its outcome (Kuaban *et al.*, 2000; Assam-Assam *et al.*, 2011; Bercion and Kuaban, 1997), duration and associated factors of patient delay during treatment in rural areas (Cambanis *et al.*, 2007), and early results of systematic drug susceptibility testing in PT treatment cases (Noeske *et al.*, 2012). Finally, publications on HIV testing, status and outcomes of treatment for TB (Pefura-Yone *et al.*, 2012), assessing the accessibility of HIV care packages among patients (Njozing *et al.*, 2010) and outcome assessment of a global fund grant for control at a district level (Yumo *et al.*, 2011) exists. Since data on the prevalence of TB in cities is lacking, this study seeks to make a survey of TB in the city of Maroua, ascertain the prevalence, neighbourhood, sex and age distribution, analyse the perception of the inhabitants vis-à-vis TB and propose preventive measures.

## RESEARCH METHODS

The study was accomplished through a combination of primary and secondary sources. To determine the prevalence of TB, clinical data from the records of four hospitals were consulted: The Regional Hospital (Zokok), Meskine Hospital (Meskine), Christ the Saviour Health Centre (Domayo) and the National Social Security Fund Hospital (Domayo) for a period of 22 months (February 2012-January 2014). These constituted hospital records based on active case findings of TB involving 733 patients. Interviews were undertaken with relevant actors to generate information on government policy in the fight against the disease. To obtain viable information from the inhabitants in relation to perception and responds to the illness and its impact on the livelihood of patients and their dependents, 390 questionnaires were administered in 13 neighbourhoods in the town using the stratified Sampling method, of which 250 were successfully retrieved scoring 64 percent. In order to delimit the frequency of TB in each of the studied neighbourhoods, two data base sources were employed; a high resolution satellite-based GIS image (Geoeyes 2015) of the town of Maroua obtained from Google Earth and GPS surveys. These were followed by thematic analysis based on 3 classes: 0-10%, 11%-20% and >21% TB prevalence. These were complemented by the use of published materials on the subject. Collected data was analysed using qualitative and cartographic techniques.

## RESULTS AND INTERPRETATION

Field evidence revealed a high prevalence and continuous increase in the number of TB active case findings of 7.33% (73.3/1000). Since the year 2010, there



**Figure 2:** Prevalence of TB in Maroua (2003-2013). Source: Field Survey (2014)

**Table 1:** Population growth in Maroua town (1950-2015)

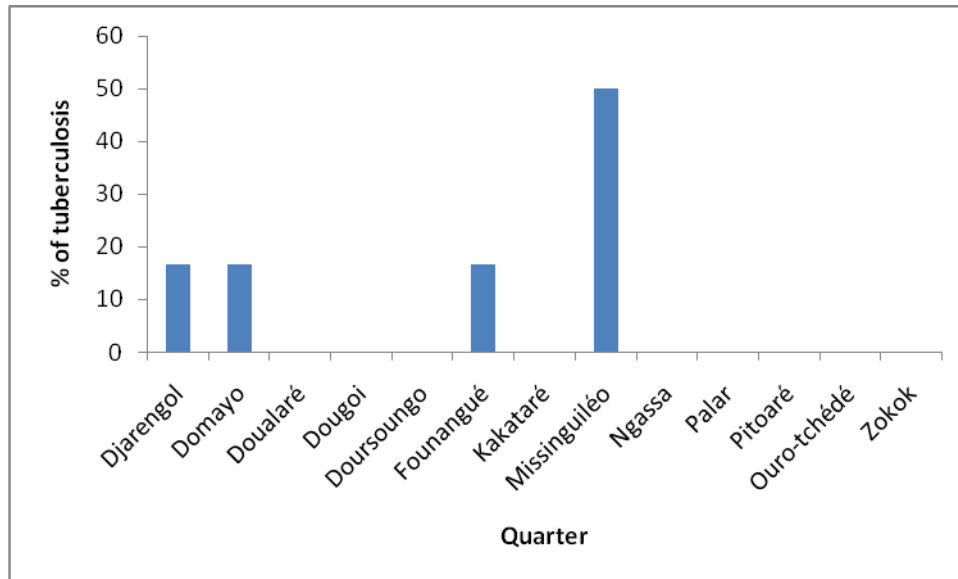
Years	Population	Rate of change (absolute numbers)
1950	17,000	-
1976	62,600	45,600
1987	123,000	60,400
1992	162,000	39,000
2001	271,700	109,700
2005	330,410	58,710
2015	# 400,000	# 69,590

# = estimated figure. Source: BUCREP (2010) and Maroua urban Council (2015)

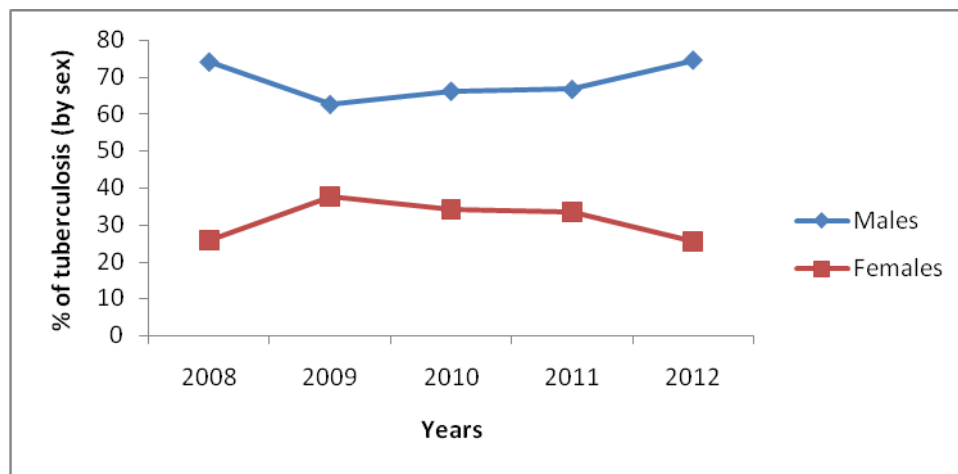
has been a staggering increase in TB incidence, after haven witnessed a drastic fall within the three preceding years (Figure 2).

The continuous increase in the number of TB active case findings could be attributed to two factors; population growth and malnutrition. The population of the town has been growing rapidly as data for the period 1950-2015 in Table 1 indicates. The phenomenal increase of the population could be attributed to two factors; natural increase (from 1.9% growth rate between 1976 and 1987 to 5% by 2015) and in-migration (the creation of The University of Maroua in 2008 which now hosts 4 professional schools and 4 faculties). Furthermore, Maroua is one of the most affected towns by malnutrition in Cameroon since the early 1990s. The situation has been rendered onerous by insecurity and the nefarious activities of the Islamic terrorist sect Boko Haram in the region which causes people to abandon their property and flee their homes (refugees), pushing them into food insecurity.

In 1997, Cameroon established the National TB Programme (NTP) upon recommendation of the WHO and UNION (The international union against tuberculosis and lung diseases), which has as goal to fight against TB throughout the country. The NTP is represented in Maroua at the Regional Hospital. In addition to the NTP at the Regional Hospital, the American hospital (Meskine) is also involved in the fight against TB in the town. The laboratory tests for TB cost 1000FCFA and treatment itself is free throughout the territory with assistance from the World Bank through the distribution of Cotrimoxazole for 6 to 8 months, while the Meskine Hospital provides logistic support. However, resistant cases are hospitalized and treated for longer periods of up to a year or more. Awareness/sensitization campaigns are regularly conducted with quarter heads and religious denominations to encourage patients not to be ashamed to declare their status and to go for hospital consultation as soon as they start manifesting the symptoms.



**Figure 3:** Analytical results of TB by quarter in Maroua. Source: Field Survey (2014)



**Figure 4:** Analytical results of TB by sex in Maroua (2008-2012). Source Field Survey (2014)

Analytical results of TB per quarter of residence revealed that some quarters are highly affected than others (Figure 3). Figure 3 reveals that four quarters (Djarengol, Domayo, Founangué and Missinguiléo) hosted active TB cases. One of the four quarters (Missinguiléo) alone records half (50%) of the total active case findings. The nine others: Doualaré, Dougoi, Doursoungo, Kakataré, Ngassa, Palar, Pitoaré, Ouro-tchédé and Zokok did not register any case of the disease. On a general note, it was observed that the incidence of TB has been on the increase lately.

Analytical result of TB by sex is illustrated in Figure 4. It reveals an inverse (but fluctuating) prevalence between males and females, with more males affected (68.8%)

than females (31.2%) as data between 2008 and 2012 indicate. From Figure 4, we realize that more males are affected with TB than females for all the years (2008-2012). The trend amongst the males between 2008 and 2009 showed a falling one, before starting to increase sharply to 2012 when it recorded its peak (74.6%). This could be explained by two factors; their socio-professional class involving risky activities and a high rate of promiscuity, smoking and drinking. On the other hand, females registered an increasing rate between 2008 and 2009 with a peak in 2009 of 37.5%, and then started to decline. This declining rate amongst the females could be explained by the fact that in northern regions of Cameroon in general (Adamawa, North and Far North

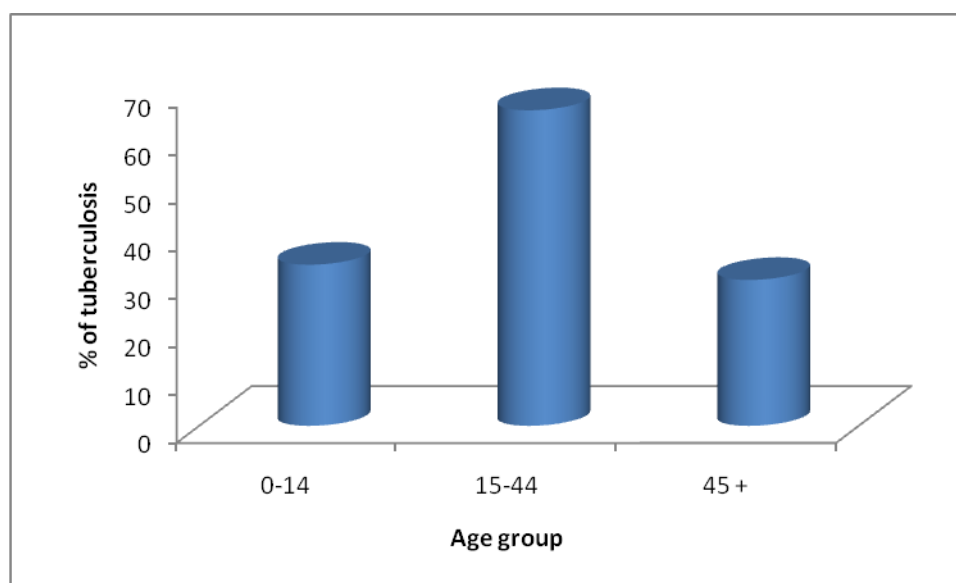


Figure 5: Analytical results of TB by age group in Maroua. Source: Field Survey (2014)

Table 2: Perception of TB by 250 respondents in Maroua

Item	Yes	%	No	%	Don't know	%
Awareness of TB and its adverse health effects	348	89.3	29	7.4	13	3.3
Notion that TB is caused by seasonal variation	370	97.87	12	3.08	08	2.05
Notion that TB is transmitted within the community by affected individuals	203	52	108	27.7	79	20.3
Awareness of TB symptoms including HIV/AIDS	109	27.9	106	27.2	175	44.9
Exposure to DOTS (early detection and treatment)	360	92.3	26	6.6	04	1.1

Source: Field Survey (2015)

Regions), custom holds that women go out very little (shopping for example is done by men) which make them less exposed to the risk of contracting TB.

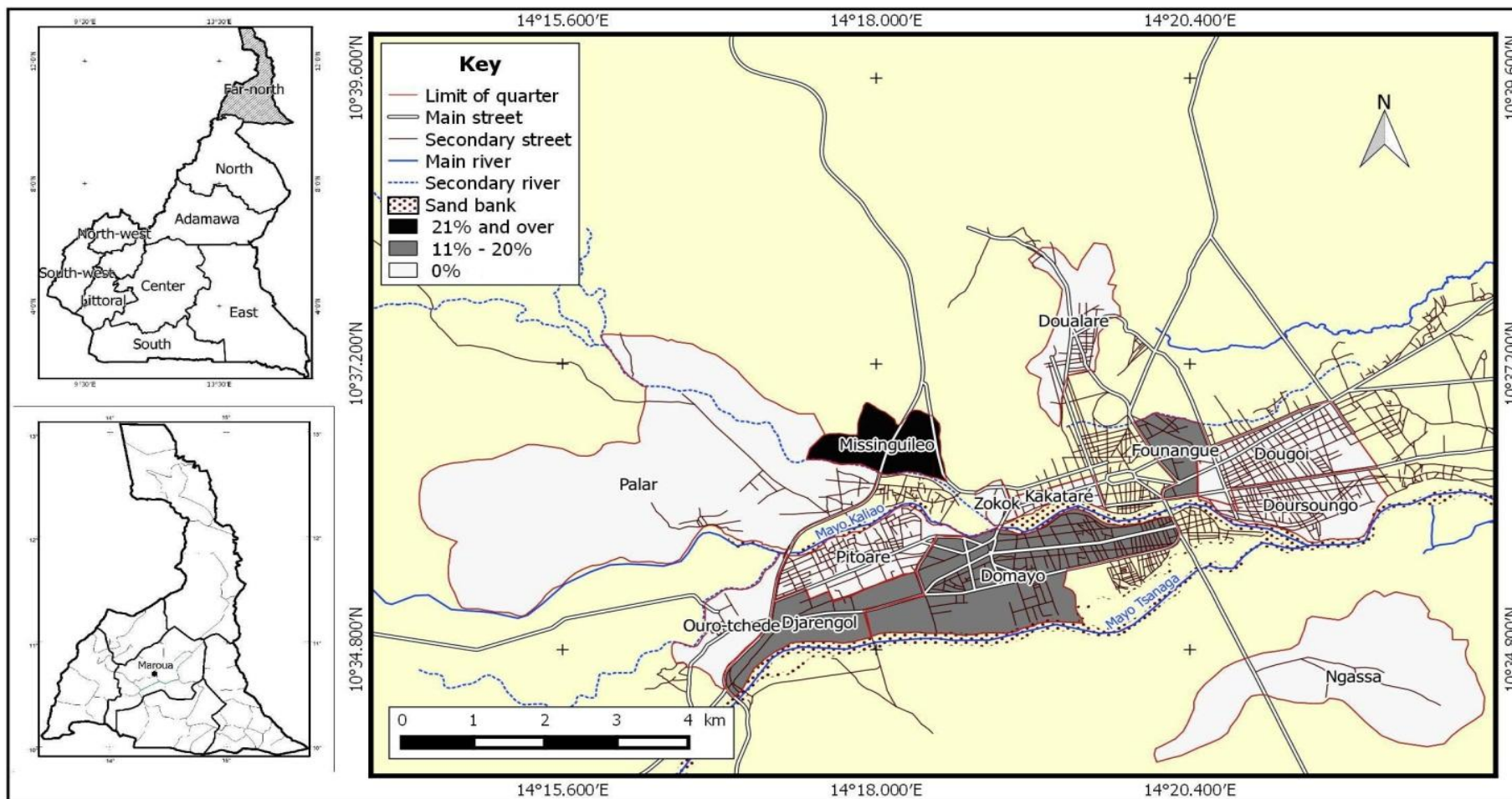
Analytical result of TB by age group was also ensured. The result showed that the most affected age group is the active one (15-44) with 65.9% as shown in Figure 5. Cartographic representation of the frequency of TB in the studied neighbourhoods depicts areas of high (>21%), medium (1-20%) and nil (0%) prevalence (Fig. 6). Variations however exist within the first two categories. Detailed examination of the 1-20% category for example reveals areas of 10.5%, 16.7% and 19% respectively. Analytical results of the 250 questionnaires retrieved from the inhabitants out of the 390 administered to sample their perception of TB is shown in Table 2. The results showed that 89.3% of the inhabitants are aware of the disease and its adverse health effects. With regards to the cause of the disease, 94.87% of the inhabitants are of the opinion that it originates from seasonal variations in the elements of precipitation, temperature, humidity and winds; while another 52% hold the view that it is

transmitted within the community by affected individuals as a result of interaction, promiscuity, poor hygienic conditions and ineffective sensitization.

## DISCUSSION

The high prevalence of TB in Maroua ties with the country trend. Studies by Bowong and Kurths (2010) earmarked Cameroon as a country with a high prevalence of TB. According to the National Tuberculosis Programme Report No.16 of May 2011 cited in Koro Koro *et al.*, (2012), the incidence of all clinical forms of TB in the country is about 25,000 new cases per year. It is estimated by WHO cited in Ane-Anyangwe *et al.*, (2006) to be 17.8% and the incidence in 2000 was estimated to be over 300 cases per 100,000 inhabitants with an estimated 21,594 new sputum smear-positive cases. In 2003, the incidence rate of smear positive (sm+) PTB cases in Cameroon was estimated at 78 per 100,000 population (WHO, 2004). Noeske *et al.*, (2006) on their





Source: Geoeyes, 2015 (Google earth Pro.), SOGEFI-2015 and datas using GPS.

By Wanie Clarkson Mvo, July 2015.

Figure 6: Cartographic representation of the frequency of TB in 13 neighbourhoods in Maroua

part opines that while the detection rates of cases are still to catch up with the estimated incidence rates of sm+PTB, TB case notification within the NTP increased between 1997 and 2004 from 544 to 18,400, with 69% of these being new sm+ PTB cases.

Urbanization and malnutrition are major risk factors of TB in the study area. The over 400,000 inhabitant of Maroua today is a propelling factor for the disease as a result of overcrowding and congestion, high level of promiscuity, sub-standard housing development, unemployment, poverty and lack of health infrastructures that characterize the area as is the case in CDC camps in the South West Region where plantation workers reside (Kamuolratanakul *et al.*, 1999 in Ane-Anyangwe *et al.*, 2006). Malnutrition results to TB from a bi-directional linkage (Chandra, 1991; Macallan, 1999 all cited in Noeske *et al.*, 2006). Cegielski and Murray (2004) and Connolly *et al.*, (2004) all in Noeske *et al.*, (2006) however argues that the correlation between malnutrition and TB is weak and their biological link is not well known.

On a general note, food production has been on a decline in Cameroon. Fonjong (2009) notes that the country has gradually moved away from one of food abundance to a country experiencing food shortages forcing it to receive her first donation of 2,600 metric tons of food from the United Nations (UN) and Food and Agricultural Organization (FAO) in August 1991. This action by the government was an attempt to remedy the food insecurity situation which is one of the tenets of the New Agricultural Policy introduced by the government in the early nineties. Unfortunately, malnutrition has been experienced in Cameroon since 1991, particularly in Maroua. The situation is so severe that it does not only jeopardize government's vision but also constrain her effort to eradicate poverty and hunger by 2015 as stipulated by the Millennium Development Goal 1. The Far North Region in general and Maroua in particular is the most affected region by famine and malnutrition in Cameroon as a result of several exogenous factors. Cameroon Tribune No. 10886/7085-45 of Monday 20th July 2015 heralds that in this transborder region with Nigeria, transborder insecurity marked by attacks and atrocities by the Islamic sect Boko Haram based in Nigeria has aggravated in the region. The mass exodus of people and abandonment of goods and homes has shoved thousands of people into food insecurity. An estimated >140,000 households are affected by the atrocities of this terrorist organization. Similarly, the arrival in the region of thousands of Nigerian refugees has exerted a strong pressure on resources. The presence of refugees also increases the prevalence rate of TB. Climatic hazards are also serious threat to agricultural production in this region. At the end of the 2014 cropping season, local officials of the Ministry of Agriculture and Rural Development (MINADER) identifies a cereal deficit of 132 000 tones while the food needs of the region was estimated at over 770000 tones.

Despite the high prevalence of TB in the study area, efforts by the government in the fight against the disease since the establishment of the NTP in 1997 are helpful via development in health systems and diagnostic tools, administering drugs free of charge in Cameroon and vaccines in the control of future TB especially as it is a curable and controllable disease. The Core Group (2013) notes that globally, TB cases declined to 8.8 million cases in 2011 and the rate of mortality from TB has dropped by 40% since 1990. The most effective and recommended WHO strategy to achieve this is through DOTS developed by Karel Styblo, now called WHO's stop TB strategy. Governments from around the world formalized the accelerated expansion of DOTS in March 2000 in the Amsterdam Declaration to Stop TB. The Global Stop TB partnership has built on this commitment and developed a plan of action, the Global Plan for TB Control. This was further updated to the Global Plan II for 2006-2015, in line with the MDGs. A central aim of the plan is to ensure that by 2015, 70% of notified TB cases globally will have access to DOTS (Vassall, 2009). Thanks to the use of the DOTS strategy, 17 million people were treated in 9 years given bright prospects for halting the spread of the disease. Also, 8 out of 10 patients are successfully treated under DOTS programme, and 45% of infected patients were treated in 2003-up from 28% in 2000 (Kofi Annan in Gotera *et al.*, 2005). DOTS is based upon the premise that the early detection and effective treatment of TB cases reduces both the current burden of TB and the spread of the disease. Murray (1991) in Vassall (2009) posits that this strategy is highly effective and cost-effective in low income settings like Cameroon in general and Maroua in particular. However, another study by Ane-Anyangwe *et al.*, (2006) holds that treatment with DOTS does not provide complete coverage of the entire territory. In the study area, DOTS treatment confronts two major challenges: Firstly, many people in the area are reluctant to go to the hospital making it difficult to determine the real impact of the disease. Finally, there is the emergence of multi-drug resistance TB (MDR-TB) case findings which limits the effectiveness of TB treatment for patients.

The observed variation in the frequency of TB per the studied neighbourhoods depicts the high susceptible of TB in the urban milieu. This confirms an earlier study in the South West Region by Ane-Anyangwe *et al.*, (2006) where Tiko (CDC camps and Mutengene) and Limbe (New Town, Unity quarter and CDC-Bota) stood out as the most highly infected areas with high prevalences in various quarters within these localities as well as Buea Town in Buea and Idenau which is a local sea port; while village settings like Mondoni, Bonadikombo and affluent neighbourhoods like Bokwangwo and Bonduma were least affected. In the same light, The Core Group (2013) highlights that TB is no respecter of persons and places as it occurs both amongst the rich and poor, whites and



blacks, villages and cities, schools, workplaces, departmental hostels, prisons and communities.

Sex disparity on TB prevalence is a controversial issue. The study reveals high TB case findings in males compared with females in the study area in affirmation with works by Ane-Anyangwe *et al.*, (2006) and Noeske *et al.*, (2006). Other studies however contrast this point of view. The Core Group (2013) observes that women are uniquely affected by TB and are often neglected in this epidemic, and that they are more likely to have active disease when compared to men, less likely to have access to health care, and often face greater stigma, including being labeled as “unmarriageable”. In the study area, women are less exposed because they go out less frequently due to cultural norms. The high incidence of TB amongst the youthful urban population in the present study (15-44 years) is in line with studies by Ane-Anyangwe *et al.*, (2006) who recorded more TB cases in the age group 21-30 years, closely followed by the age group 31-40 years in the Southwest Region as well as that of Noeske *et al.*, (2006) amongst the 15-54 age group as a result of the advent of HIV/AIDS dominant among this age group in the country. The Core Group (2013) postulates that the high incidence of TB amongst the youthful population decrease their ability to contribute to socio-economic development and support their families.

## CONCLUSION AND RECOMMENDATIONS

Data from the survey shows a high prevalence (7.33%) and increasing incidence of TB in the study area, suggesting that urban areas are potentially high risk environments for TB transmission. The high prevalence of TB in the town decreases life expectancy thereby jeopardizing socio-economic and urban development which is a process of social, economic and urban development in a society aimed at improving standards of living, life expectancy, literacy and levels of employment. In 2014, Cameroon's growth rate stood at 5.3%, below the 6% average growth target set in the 2010-20 Growth and Employment Strategy Paper (GESP) which aims to include the country into the group of emerging nations by 2035. The population of this region has witnessed a dramatic increase in recent years as observed in 2010 by BUCREP, accompanied by increasing rates of TB infection. The link between TB and adverse health effects was directly expressed by 89% of the inhabitants showing the role of the disease to the livelihood of the population. Despite free TB treatment with DOTS with assistance from the World Bank, many people in the area still die from the disease due to ignorance as an astonishing 94.87% of the population relate its cause to seasonal variation, while 20% of them did not even know the cause and 45% the symptoms. This study gives analytical results of TB in Maroua as well as provides

recommendations for policy intervention in the fight against the disease. It highlights that due to the high prevalence and increasing incidence of TB in the city, the population is exposed to greater levels of vulnerability thus exposing them to greater levels of mortality and morbidity, poverty, unemployment, deprivation and illiteracy. There is need therefore for urgent preventive measures via the following recommendations:

The government should try and create a Community-Based Approach (CBA) to tackle TB in the town since anyone can get the disease-men, women, children, physically disabled, etc. The CBA should form a nexus between community members, NGOs, CIGs, civil society organizations, community health programmes, development organisations, religious groups, patient advocates, kinship groups, traditional rulers, public health doctors, nurses, midwives, neighbourhood associations, households and individuals in the fight against TB. It should be a complement, not a replacement of the NTP of the government, and the local language (Fulfulde) that is widely spoken in the region should largely be the language of instruction. Also, to control the spread of TB in the town, policy makers should identify, plan and channel financial and economic resources to TB programmes as recommended by Vassall (2009). This should be sustained by funding and political commitment. To curb the problem of ignorance, there is need for the NTP in partnership with the CBA to step up sensitization campaigns by aimed at encouraging patients to go for hospital diagnosis and treatment, educate public and health workers, reduce stigmatization via education, and identify and give advice to patients. Likewise, there is the dire need to increase, train and better equip workforce for the fight against TB in the town in order to salvage the current situation so as to effectively improve the health of patients.

Perhaps to prevent the further spread of TB to other members in the community, a policy to quarantine the identified patients and inhibit their movement from one region to another during treatment could be implemented. More so, there is need for the intensification for the fight against HIV/AIDS since it co-exists with TB in the most cases via the provision free of charge of anti retroviral drugs and encourage the use of condoms against a population whose custom forbids its use. Coupled with the above, there is need to extend the range of the use of DOTS to involve all or a vast majority of the infected patients, who currently do not have access because of its limited supply, as well as voluntary TB and HIV/AIDS counseling as recommended by the National Aids Control Programme in the country.

Finally, to encourage many of the patients to seek diagnosis in the hospital, there is need to subsidize to half, or completely eradicate the laboratory test fee for TB which currently costs 1000 FCFA. This is important because majority of the inhabitants complained they lack the money to take the test and know their status and so

die from the disease.

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