THE PATTERN AND TREND OF MOTOR TRAFFIC INJURIES AND THEIR IMPACT ON HEALTH SERVICES IN KIBAHA DISTRICT 1996 – 1999.

BY

AHADIEL MAHANDE RAPHAEL SENKORO, DDS (DAR).

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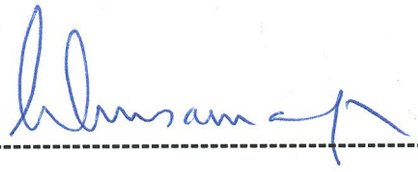
CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance by the University of Dar es Salaam a dissertation entitled:

The Pattern and Trend of Motor Traffic Injuries and Their Impact on Health Services in Kibaha District from 1996 to 1999, in partial fulfilment of the requirements for the degree of master of Public Health.



DR. G. I. MSAMANGA, MD; DPH; MSc; ScD.

(SUPERVISOR)

Date 30.9.2000

DECLARATION

AND

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I, Ahadiel Mahande Raphael Senkoro, declare that this dissertation is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

SIGNATURE ----------

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DEDICATION

To my wife **Mary** and

my children; **Raphael, Emma (Haika) and Daniel**

ABSTRACT

An operational research was conducted in Kibaha district from 6th June to 31st July 2000, to describe the pattern and factors associated with motor vehicle accidents (MVAs) along the Chalinze Dar es Salaam highway in Coast Region, Tanzania. The study was based on a retrospective review of records obtained from Kibaha police station and Tumbi hospital from 1996 to 1999. Using a cross sectional study design, additional data were collected from motor related accident victims who attended emergency treatment at Tumbi hospital during the month of June and July 2000. A total of 584-hospital-based accident records and 48 police reports, compiled on monthly basis, were reviewed and 35 accident victims were interviewed.

The study revealed that a total of 2102 MVAs occurred along the Chalinze – Dar es Salaam highway in Coast Region from the year 1996 to 1999. The average was approximately 525 accidents per year and the trend was almost the same during the four years. Overall MVAs were responsible for: 83% of all accidents, 82.5% of all injuries, and 88.8% of all deaths. A total number of 2601 subjects were reported to be involved in MVAs during the four years. Males were more likely than females to be involved in such accidents, 80% and 20% respectively. The majority (77%) of victims were between the age of 20 and 39 years and approximately 20% were reported to have died. Pedestrians were at highest risk of dying of MVAs (38.3%) followed by pedal cyclists (17.9%) and motor-cyclists (25%) during the year 1999.

Most of the accidents occurred during daytime (51.6%) when the road was dry (86.3%). Victims were significantly more likely to die from motor vehicle

accidents occurring at night than during the day, 20.9% and 14.8% respectively ($p< 0.05$). Driving at night while it is raining was significantly associated with a three-fold increased risk of dying from a MVA than during daytime. The Odds ratio was 3.23, and 95% Confidence Interval 1.76, 5.91).

Three factors identified to contribute highly to motor accidents were over speeding (32.8%), dangerous / careless driving (23.7%), and mechanical defect of the vehicles 13.3%). Many casualties were caused by vehicle overturn (40.2%), vehicle collision (23.5%), pedestrian being knocked down (19.8%) and tyre burst (11.9%). The sites that were found to be more prone to accidents than others were Chalinze, Kibaha-Maili moja and Kiluvya. Availability of transport to ferry the road accident victims to hospital was facilitated by privately owned vehicles and police cars in 94.3% and 0.7% of the cases respectively. In all accident victims, first aid that was not available for any one of them starting from the time of the accident occurred until they arrived at the hospital. Injuries found to be life threatening were head injuries and intraperitonial hemorrhage that resulted in a hospital stay of 5 days and 12 days respectively. The trend of referring accident victims appeared to increase annually, from 3.7% in 1996 to 6.2% in 1999.

It is recommended that traffic police, ambulance operators, bus drivers and conductors should be trained on how to give first aid to injured people. Buses should have first aid kits with gloves available. Also to control and prevent road accidents there should be a continuous promotion of public awareness and media campaigns on road safety, improvement of drivers competency, enforcement of road safety regulations and a clear national policy on road safety.

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ABBREVIATIONS

1.	CRHSR	-	Coast Region Health Statistics Report
2.	CRREO	-	Coast Region Regional engineer's Office
3.	C. I.	-	Confidence Interval
4.	CSA	-	Council of Scientific Affairs
5.	KSRC	-	Kibaha Sugar cane Research Centre.
6.	MMWR-NN	-	Morbidity Mortality Weekly Report – Nowajo Nation.
7.	MTAs	-	Motor Traffic Accidents
8.	MOH / CSD	-	Ministry of Health / Cost sharing department.
9.	MVAs	-	Motor Vehicle Accidents
10.	NSW	-	New South Wales – Australia
11.	TMOH	-	Tanzania Ministry of Health
12.	TNRSC	-	Tanzania National Road Safety Council
13.	WARTB	-	Western Australia Road Traffic Board
14.	O. R.	-	Odd Ratio

Definition of terms

1. **Conditions of the victims were defined as follows:**

(i) **Death:** Persons were reported as killed only if they died from their injuries within 30 days from the accident.

(ii) **Serious injury:** An injury for which the person was detained in hospital as an "in patient" or any of the following injuries, whether or not he/she was detained in the hospital: Fractures, concussions, internal injuries, severe cuts and lacerations, severe general shock requiring medical treatment.

(iii) **Slight injury:** An injury of minor character such as sprain, bruises or persons who complain of shock but who sustain no other injury are only included if they received or appeared to require medical treatment.

2. **District hospital**

The working definition of a District hospital as given by Tanzania, Ministry of Health is that, it is a last referral point at the district level. It comprises of beds ranging from 101-175 (MOH/CSD, 1999).

1.0 INTRODUCTION

1.1 GENERAL INTRODUCTION

The rate of motorization in the developed world is increasing very fast but the rising accident curve of the fifties and sixties has now reversed due to effective use of road safety control measures. Industrialised countries appear to have introduced interventions that reduce the incidence of road traffic injuries and improve survival of those injured (Soderlund et al 1995).

In developing countries, including Tanzania, the scenario is different, motor traffic accidents (MTAs) are increasing with time and mortality due to MTAs is also on the rise. This scenario calls for developing countries to put more effort toward control and prevention of motor traffic accidents and their outcome. This can be achieved through multidisciplinary approach and research.

In Tanzania, very few studies have been on concerning motor traffic accidents. Data available are mostly those from police reports, but these are not enough to give details of factors, which influence the occurrence of accidents and pattern of injuries in our setting. There is need therefore for public health professionals to engage in research on MTAs so as to fill in the gap of knowledge that is existing. Availability of data will assist policy makers to make appropriate decisions and act seriously on the problem. The positive aspect about MTAs is that most of them are preventable. Worldwide the most affected population is the young age group, which is economically active. In developing countries the social and economic implications of

this large-scale loss of the most energetic and productive segment of the community in whom a lot has been invested, are far reaching (Asogwa 1992).

In this problem there are many players: (i) The police who are interested in legal enforcement (ii) The insurance companies and vehicle owners in the monetary cost (iii) The accident victims and their relatives in loss of lives or disability and related cost of medical care (iv) medical personnel who are responsible for the management of accident victims (Asogwa 1978).

1.2 STATEMENT OF THE PROBLEM

Motor traffic accidents (MTAs) in Tanzania have been increasing since independence in 1961. There has also been a simultaneous increase in the importation of vehicles. Motor related accidents occur in Dar es Salaam and major upcountry highways much more than many other urban centres. In 1980's, the Government started to take some measures to control this problem. The existing regulations were enforced, including the annual road safety campaigns, also the buses were prohibited to travel during the night and of recent the Government has introduced vehicle speed governors in all public buses.

The National road safety council of Tanzania in 1999 reported that the problem of motor traffic accidents was on the increase for the last ten years. In 1987 the number of accidents that had occurred was 9,674 while in 1997 it had increased to 14,335 accidents, an increase of 48.2%.

On average 54% of all accidents were due to drivers' faults, 16% due to mechanical defects of vehicles. Approximately 81% of road accidents victims were pedestrians and passengers. The Council also reported that 35% of all motor traffic accidents in Tanzania occurred in Dar es Salaam and that pedestrians contributed 65% of all motor related deaths.

It is estimated that Tanzania is loosing 25 billion shillings every year as property loss, treatment expenses and road damage as a result of motor traffic accidents. It is also estimated that the loss experienced by Tanzania is twenty times greater than that of England and twenty five times compared to that of Sweden which has 16 times more number of vehicles than Tanzania (TNRSC-1999).

From the figures above, it seems that reckless driving, over speeding and use of inexperienced drivers may have contributed to the high motor traffic accidents in Tanzania. Another factor is the narrow old road designs. There are also problems of under reporting and proper licensing of drivers.

There was a great public concern that despite all efforts taken by the Government through the police and political leaders to educate road users, the problems of MTAs were still increasing particularly along the Morogoro highway stretch in Coast region. The public concern had also to be taken seriously by public health professionals to find out the reason for this continued increase, its impact to the society and health delivery system. There was need therefore to study the pattern of MTAs to assess the circumstances and conditions under which vehicles were driven

on the high way along Kibaha district. There was also need to study the availability of optimum case management at the nearest health facility.

In general the importance of injury as a public health problem is not well recognised in many Developing Countries (Lie et al 1991). Motor traffic accidents are a major world wide problem. In Developing Countries the trend has reached an alarming state but very little attention is paid to the problem (Odero et al 1997, Jayasuria 1991; Bener et al 1992).

An analysis of cross sectional data on road traffic related deaths has shown that the poorest countries have highest road traffic related mortality rates (Soderlund et al 1995). In this analysis, many industrialised countries appear to have introduced interventions that reduce the incidence of road traffic injuries and improve survival of those injured (Soderlund et al 1995). A study done in Calcutta India, reported that there are some host (human) factors (such as drivers, pedestrians and cyclists) and seasonal factors (weather and time) that contribute to fatal road traffic accidents (CSA-1983; Zhang et al 1998). Overall, most MTAs occurred on broader roads (highway) and in the majority of cases pedestrians were found to be at fault during crossing the roads (Majumder et al 1996).

Studies done world wide have shown that motor accidents are the leading cause of death of many adolescents and young adults (Odero et al 1997; Balogun et al 1992).

There is evidence that using minimum safety standards, crash worthiness improvements, seatbelts use laws and reduced alcohol use can reduce deaths on the road (Leon 1996).

1.3 Rationale of the study

The study has added knowledge on trend and pattern of occurrence of road accidents and related injuries in Tanzania. The data obtained in this study, can be used by the road safety authorities for planning and evaluating road safety measures. The data can also be utilised by the health authorities in Kibaha District, Coast Region and at National level for planning health care delivery at Tumbi hospital, Kibaha. The recommendations given if considered are going to benefit the public at large on prevention of road accidents. The data can also be utilised as baseline data in future related researches.

2.0 LITERATURE REVIEW

In the past, motor traffic accidents used to be a problem of industrialised countries but now it is becoming an epidemic in Developing Countries (Odero et al 1991; Soderlund et al 1995;Vasconcellos 1999;Oluwasanmi 1993; Hayes 1977). The trend in road traffic accidents in studies done in Nigeria, New Papua Guinea and Tanzania illustrate that MTAs is a rapidly growing problem for Developing Country (Asogwa 1992; Jayasuriya 199; Kayombo 1995).

A study done in China reported that with increased motorization, leading to road congestion, has been associated with increased road trauma. China as a Developing Country has started to experience this problem which was non-existent before, when the majority of the people were using bicycles as a major means of transport (Robert 1995).

Studies done in the U.S.A. have reported a significant decline in traffic fatality rates as a result of improved road safety measures (Graham 1993). Broughton (1991) in Great Britain has also reported a similar decline. The author noted that there was an increasing rate in the occurrence of casualties followed by decline in recent years, a pattern that is similar to most Developed Countries (Broughton 1991).

Between 1986 and 1988 injuries were the second leading cause of death among American Indians and Alaskan natives. The injuries accounted for 22% of all deaths.

Motor vehicle related injuries were threefold higher than among the total United States of America Population (MMWR 1992).

Bener et al (1991) in Saudi Arabia reported that motor traffic injuries are becoming a public health epidemic and yet relative to other causes of morbidity and mortality, the amount of attention they have received from public health professions and scientific community is very minimal (Bener et al 1992).

2.1 Factors associated with motor traffic accidents

The occurrence of motor traffic accidents is associated with three major contributory factors including human, mechanical and road factors (Sarungi 1981). Other factors including the road users, vehicles, environment and time have also been reported (CSA-1983; Rivara 1985). For an accident to occur, one or more of these factors have to play a part.(Graham 1993). The study by Graham (1993) reported that motor accidents were prevalent in certain age groups and they occurred at certain hours of the day and week and at certain locations. Some people are more susceptible than others and susceptibility is increased by the effect of alcohol and other drugs as well as other physiologic states such as fatigue (Graham 1993).

The human (road user) factors include the drivers' characteristics, car occupants, pedestrians, bicyclist and motor cyclist. Under the vehicle factors including its design, lighting system, break system and its use are significant contributors to MTAs. The environmental factors include the design of roads, its geographic location, season, weather, visibility, time of the day and traffic regulations (Leeming 1969, CSA-1983). A clear understanding of the causal factors is of utmost

importance in any attempt to design a road safety promotion or preventive program (Sarungi 1981).

2.1.1 Human factor

The human factor or error contributes to the majority of road traffic accidents. A study done by Odero (1995) in Kenya reported that human factors were responsible for 85% of all causes (Odero 1995).

2.1.1.1The driver

A good control of the vehicles on the road depends very much on the behaviour (which is very complex) and skills of the driver (CSA 1983, Graham 1993). Driving is a complex system in which a large number of variables are interacting with each other but also with varying degree of dependence. Accidents may be due to judgement errors, ignorance, incompetence, or carelessness, all of which are human errors (Leeming 1969).

A study done by Shaw et al (1971) has reported that psychomotor personality function reasoning, motor speed and co-ordination and reaction time are factors related to motor accidents. The authors also mentioned that stability behaviour of the driver during danger could reduce or increase the risk of accidents (Shaw et al 1971). Excessive speed is also mentioned as a major contributing factor on road crashes and subsequent injury rates of persons injured. Similarly property damages appear to be linked to the vehicle's speed at impact (Shibata et al 1994).

The importance of paying attention when driving was revealed by Redelmeier et al (1997) in their study on use of cellular phones. The authors reported that the risk of collision when using cellular phones while driving was four times higher than when cellular phones are not used. The authors also reported that having a cellular phone could be of advantage because 39% of the drivers managed to call emergency service after collision. They also mentioned other behaviors, which can disrupt the attention of the drivers These include activities such as drinking a beverage, lighting a cigarette or taking ones hand out or away off the steering wheel while driving (Redelmeier et al 1997; Violanti 1996).

Studies done on drivers after being involved in motor accidents reported that although alcohol is the most prevalent source of driver's impairment, other drugs or substance abuse can also contribute to the problem (Violanti et al 1996; Kayombo 1995; Broughton 1991; Leon 1996; Shibata 1994). Driving under the influence of alcohol or other drugs of abuse are known to impair the driver's ability to judge and control the vehicle (CSA-1993,Orsay et al 1994). The impairment caused by alcohol is related to the amount of alcohol consumed or high alcohol blood levels (Kobus 1991). Blood levels above 100mg/dl are considered to be dangerous for drivers especially in the U.S.A.

The driver's age is also known to be an important factor contributing to occurrence of accidents. Leon et al (1996) observed that reckless driving in adolescents has been associated with increased risk of crashes (Leon 1996). The problem with young drivers is that they like risk taking behaviour, also they lack driving skills

(Vasconcellos 1999; Zhang et al 1998). Massie et al in their study reported that age group between 16-19 years has been associated with higher rates than other age groups (Massie et al 1995). The problem of young drivers is also mentioned as an important variable contributing to high fatalities or injuries (Hakims 1991). A certain study has also reported that young and inexperienced drivers are often over represented in crashes. In 1991, drivers aged between 17 and 24 years were involved in 35% of fatal and 30% of casualty crashes (WATB 1992). Subjects aged 70 years and above were also found to be at risk of MTA because of impaired reaction time and vision. Though impaired vision of a driver regardless of age is a risk factor, many drivers however are not aware of their visual problems (Hayes 1977). Another problem of old drivers, which leads to a higher risk of having a motor accident, is the difficult in judging and responding to traffic flow (McGwin et al 1999, Zhang 1998). Massie et al in their study have also reported that older drivers (75 years and over) have the highest rate of fatal accident involvement while young drivers have highest rates of injurious involvement (Massie et al 1995).

Other studies have suggested that drivers' fatigue is a factor in approximately one in four casualty crashes (NSW 1998). Further more, fatigue-related crashes occur more frequently on weekends than weekdays and they typically occur in early morning. Most of the crashes also involve the less experienced and non-professional drivers (Asogwa 1978). Fatigue due to long distance driving is a risk to road accidents. It is advised to plan resting points in advance before starting a long journey (NSW-1998). Fatigue also can be caused by day work (Zhang et al 1998).

Males are more involved in motor accident than females (CSA- 1993). Messie et al in their study found that males compared to females have a higher risk of experiencing fatal crashes, while women have higher rates of involvement in injury crashes (Massie et al 1995). Rivara et al (1985) have also reported that among the drivers of motor vehicles that struck victims, 69 % of them were males and 31% females. Some medical conditions are also mentioned to be risk factors for driving (Hayes 1972). For example, diabetes and epilepsy have been identified as factors that are associated with increased risk if a person is allowed to drive (Odero 1997, Redelmeier et al 1997 and Lave et al 1993). Walter in 1973 reported that the frequency of road accidents involving epileptics and diabetics is double the normal and for a heart patient it is 60% higher (Kent 1991; Zhang et al 1998). However, a study done by Guibert et al (1998) failed to reveal a significant association between the above medical conditions with motor vehicle crashes (Violanti et al 1996).

Training of drivers increases their driving skills. A study done by Asogwa in Nigeria has revealed that a sizeable proportion of drivers who posses driving licenses never showed up in any driving school or went through a driving test but simply bought their licenses. Untrained drivers, not unexpectedly, often result in high accident rates (Asogwa 1992).

In emergency conditions, stopping distance is also important. However this depends very much on the driver's reaction time, speed of the vehicle, quality of tyres, and the condition of the road (Leeming 1969).

2.1.1.2 Car occupants

The individuals travelling in the vehicles that are passengers are also called car occupants. Occupancy rate is also mentioned to be as important in determining fatality rate following MTA. If the number of passengers is low when a crush occurs few people will be involved. The increased number of vehicles in some countries has reduced the number of passengers per vehicle and therefore reduced number of casualties (Graham 1993). A study done in Ohio state in the USA revealed that car occupants dominated in fatality rate of 53% (Kent 1991).

The size of the vehicle is also an important factor in determining the fatality or injury to the occupants. Smaller vehicles have been associated with higher occupant death rates because of less interior space to decelerate (Leon 1993).

2.1.1.3 Pedestrians

In the majority of cases of motor traffic accidents the pedestrians are often at fault (Majumder et al 1996). A study done in Sweden reported that pedestrians contributed 29% of all deaths due to motor accident (Kent 1991) as compared to 40% in Great Britain (Leeming 1969). In another study by Rivara (1985), pedestrians constituted 43% of the total number of deaths due to motor accidents and they were 37% more common than occupants' (passengers') deaths. He also reported that half of the pedestrian injuries occurred at night, therefore he suggested use of reflective clothes or reflective patches are important in reducing such deaths (Rivara 1985). According to the Ministry of Health the 1998 statistical report showed that out of all transport

related mortality 51% of those killed in Dar es Salaam were pedestrians (TMOH – 1998). In a study done in Kenya it was also reported that vehicle - pedestrian collisions were most severe and pedestrians comprised of 42% of all deaths due to motor accidents (Odero W 1995).

Age of the pedestrian is associated with motor accidents (Carey et al 1993). Male pedestrians of age group 50 years and above were mostly involved during the time of 5 am to 12 noon (Majumder 1996). Increasing population density was associated with a proportionately greater number of traffic-related deaths in the young and the elderly (Soderlund et al 1995; Sayi et al 1993). In another study done by Kong et al it was also reported that male victims were higher (66%) than females (34%), but in the elderly victims females were outnumbering males (Kong et al 1996). Congestion and crowded housing, industrialization and limited play facilities have also been found to favor motor accidents (Rivara et al 1985).

A study done by Barreto et al observed that exposure to high intensity noise at work place tends to be associated with occupationally acquired hearing deficits. These deficits increase the risk of motor vehicle injury to pedestrian workers (Barreto et al 1997). Travelling long distances to obtain alcohol is associated with increased risk of pedestrian motor vehicle crashes if the pedestrian has to cross roads when going back home (Gallaher et al 1992).

2.1.1.4 Cyclists

In a study done in Kenya cyclist accidents contributed 8% of fatal motor related accidents (Odero 1995) and another study done by Kent et al in Sweden showed that cyclists contributed 38.9%. Cyclists were found to be the most prone group together with the pedestrians (Kent 1991).

2.1.2 Vehicle

The mobility with ability to distribute goods easily and cheaply has been the benefit that motor vehicles have conferred to human race. Vehicles have very much reduced incidental deaths of patients either by rushing them to a health facility or doctors visiting their patients promptly. With all those benefits travel is always dangerous (Leeming 1969)

Increase in income per capita is associated with increased number of vehicles purchased and in turn this may lead to increased accidents (Khair 1990; Leon 1996; Hakims et al 1991). Vehicle miles traveled (VMT) and periodic vehicle inspection are also variables appearing to affect the number of motor accidents (Jegede 1998). There is some evidence from motorways that accident rate per vehicle mile falls with increasing, traffic density up to a certain point and it may rise again after reaching that point.

Vehicle characteristics and vehicle use are frequently cited in the literature as being potentially important factors contributing to high motor vehicle related fatality rates. A study done in Papua New Guinea revealed that vehicles are overloaded and

improper vehicles are used to transport passengers thus increasing the risk of accidents. Similarly open back vehicles have also been reported to be associated with increased risk to passengers (Nelson et al 1991).

Among factors associated with increase of human loss, person injuries, and property damage were thought to be greater power of the vehicle involved and an increasing number of heavy goods vehicle (Bener et al 1992).

Design and enhanced breaking, better tyres and extended visibility due to improved lighting reduce risk of accidents. Defects in design or manufacture of vehicle can threaten occupants' safety. Improvement of the interior of the vehicle tends to increase the safety of the occupants (Graham 1993). The unstable pickups and trucks have high tendency of roll over due to raised center of gravity (Leon 1996).

Crash worthiness, as a car design is important in preventing injury during collision. Injuries to occupants of motor vehicles during crashes result from the human body (occupant) striking the components of the vehicle with a force greater than the strength of the tissues of the body. Thus it was established that the primary forces in a car crash are usually below the levels at which death occurs.

The trauma in actual accidents comes from the secondary collision, where the occupants strike individual objects with their heads or limbs and decelerate to zero in an inch or two under very localised forces. It is forces of that magnitude, which break the bones and rupture blood vessels. Therefore the vehicle interior should be so designed to reduce the secondary collision severity (CSA-1983, Leeming 1969).

2.1.3 Road design

Well-designed roads with separate lines for pedestrians and cyclists are much safer than those without such facilities. Sometimes barriers to discourage pedestrians to motor roads reduce the rate of injuries. Modern roads are safe because they are well designed with all important signs (Graham 1993;Beenstock et al 2000). The road signs should be clear in themselves and should convey an unmistakable message to the driver.

The super elevation of highway roads such as tilting the road surface downward towards the inside curve has shown a positive effect in reducing motor accidents. The mechanism behind is that the slope produces a force tending to push a car inwards and this interacts with some or all of the centrifugal force, which in turn acts outwards on any object moving in a curve path. The force acting along the road surface is called the lateral force. It is usually expressed as a proportion of the weight of the vehicle (Leeming 1969).

It has also been observed that accidents mostly occur on broader roads than narrower ones (Majumder et al 1996). In Nigeria they regrettably reported that better roads have resulted in excessive speed and reckless driving resulting in an increase rather than decrease in death toll on national roads (Asogwa 1992). Parking on the streets has also been shown to be associated with an increased risk of road accidents (Rivara et al 1985). Rivara et al also suggested that, speeding of vehicles in over crowded areas can be reduced with speed bumps, circles, traffic signs and signals.

2.1.4 Season time and locality

There is a relationship between seasonality, weather and time factor in motor traffic accident occurrence (CSA-1983, Jegede 1988, Zhang et al 1998). Fatal accidents mostly occur during winter season. A study done by Kong et al has revealed that most of the accidents occur during the night, weekends and during months of October to December (Kong et al 1996).

A study done by Muelleman et al (1993) reported that motor vehicle deaths had urban and rural differences (Muelleman et al 1993). Odero in Kenya, has also reported that 60% of the reported road traffic accidents occurred on rural roads and had a higher case fatality (CFR) of 16% compared to those of urban area 11% (Odero 1995). Another study in United States of America has reported that fatality rate on rural roads and highways are higher than on urban roads and highways, in part because of congestion in urban areas which in turn reduces travel speeds and lethality of crashes (Graham 1993).

2.1.5 Causalities and medical care

Increased GNP per capita and increased proportional spending on health care are associated with decreasing case fatality rates among traffic accident victims (Soderlund 1995). A study done by Kong (1996) revealed that operations were performed in 22% of patients and orthopedic procedures were most frequent. The mortality rate of patients (Victims) was 6% (Kong et al 1996). A study done in Jamaica has also shown that trauma accounted for 20% of all cases admitted to general surgical wards and road traffic accidents contributed 20% of the cases (Crandom et al 1994).

Odelowo in his studies of patients managed at the hospital found that 72% of the patients with thoracic trauma were motor related and the proportion of male victims was higher (79.9%) than those of females (20%). Mean age was 29.4 and 14.6 years respectively. He also found that admissions were highest on Mondays and Wednesdays (Odelowo 1991,1993,). Another study showed that 20 to 40 year age groups recorded the highest incidence and males were twice as prone to road traffic accidents as females (Balogun et al 1990). Sayi et al in Tanzania in 1993 also reported that 57.7% of the injuries were due to motor accidents.

In 1978 motor vehicle related injuries accounted for 35% of total deaths in the United States of America with the four main categories being motor vehicle occupants, motor cyclist, pedal cycle motor vehicle collisions and pedestrian motor vehicle collision (Rivara 1985).

2.2 Prevention

Dum et al observed that motor vehicle crashes caused the largest number of preventable injuries (Dunn et al 1993). Graham summarized the preventive measures must include key factors such as improvement of highway design, vehicle design and improved medical practice (Graham 1993).

Mhina et al (1993) suggested that dissemination of knowledge on the initial care for spine injury patients is also important so as to improve the prognosis of spinal injury complications (Mhina et al 1993). This knowledge however, should be given to

ambulance crew and traffic police who often provide first aid to accident victims (Shibata et al 1994; Asogwa 1978; Mhina et al 1993).

Thomsom et al found that riders with helmet had an 85% reduction in their risk of head injury compared with those without a helmet (Thomsom et al 1989). Rivara has also reported the effectiveness of the helmets in pedal cyclists and motor cyclists (Rivara 1985). Mandatory use of helmets in Sweden showed the same good effects (Kent 1991). The effectiveness of helmet use is dependent upon the speed of the motor cyclist. It is more protective at low speed of 50 km per hour but less effective at higher speeds.

Safety belt use by front seat occupants has been found to reduce motor vehicle related injuries (MMWR-1992; Leon 1996). Broughton in England observed that compulsory seat belt wearing was beneficial (Broughton 1991). Seat belts for older children and adults prevent approximately 50% to 60% of all fatalities resulting from MTAs (Rivara 1985).

It is well documented that the use of child restraints, specifically child safety seats, can reduce morbidity and mortality in young victims of motor vehicle crashes (CSA-1983). Appropriate restraints prevent approximately 90% of fatalities in 0 to 4-year old age group (Rivara 1986).

Behavioural interventions and tighter regulations are also important measures (Jayasuria 1991, Graham 1993). However legislative and other counter measures proved ineffective in Nigeria (Asogwa 1992). Promotion of road safety through the

use of targeted media campaigns at community level can effectively reduce motor traffic accidents (WATB 1992)

2.3 Report and evaluation problems

Studies of motor traffic accidents rely on police records to identify crashes and sometimes to assess the degree of injury sustained by the occupants. Because police reports of injury are based on brief observations at the scene or in the emergency department the accuracy and detail of the reports are limited. Some of the injuries are under reported because of social sanctions related to the perpetrator and fears of reprisal and social stigma related to the victim. Therefore a numerator problem may be related to our ability to count the injuries.

The denominator issues are related to our ability to calculate injury rates.
The problem is how to obtain the denominator. Motor vehicle collision injuries are typically examined using numbers of events in a region, the numerator and the population of the region in the denominator. This approach exaggerates the injury rate of a region that has many visitors but many residents who drive outside the region. Therefore for many situations the ideal denominator may not be available.

The number of miles driven is said to be the best choice of denominator if engineering advances have made safer driving. Interviews are sometimes not possible because the victims are severely injured or dead. This increases the rate of non-respondents:

Suggested solutions:

By keeping the data collection simple and structured the non-response may be reduced. Special data collection form should be used in hospitals.

Special clear classification of injuries should be developed depending on the aim of the research.

The most common schemes are based on:

(i) Anatomy e.g. Head injury, spinal injury etc

(ii) Pathologic mechanism e.g. Fracture, Laceration, burn

(iii) Etiological mechanism e.g. gun short wound, bite wounds, iron, poisoning, motor traffic accidents etc.

The rate used to evaluate the effectiveness of counter measures and to compare the safety of different countries and of different periods of time are "death per registered vehicle" or death per vehicle kilometer. According to David, this does not provide a consistent measure across time when there is a linear relationship between number of deaths and number of vehicles (David 1991). The use of number of persons killed rather than the number of fatal accidents might be questioned, as one is the outcome of the other. He is suggesting that more subdivisions of the total would be of more interest such as the numbers of different road user types within age groups. While death could be one of the common currencies of road injuries for comparing countries.

Studies done worldwide have reported several factors associated with motor traffic accidents. In each of the reviewed studies the authors tried to analyze the factors and

finally gave suggestions to the relevant bodies on how best the information gathered could be used to reduce the risk of motor traffic accidents.

In this study the investigator analysed the pattern, factors associated and the outcome of motor traffic accidents in Kibaha District. The analysis also included health care provided to motor accident victims. At the end the Investigator was in a position to suggest to the relevant authorities ways of reducing the risk of motor traffic accidents in our local situation.

3.0 OBJECTIVES

3.1 BROAD OBJECTIVE:

To describe pattern and trend of motor traffic injuries along Kibaha highway and their impact on provision of health services in the District in 1996 to1999.

3.2 SPECIFIC OBJECTIVES:

1. To identify the pattern and trend of motor traffic accidents in Kibaha District from 1996 to 1999.
2. To describe different types of motor related injuries and relate them to survival status of accident victims.
3. To identify factors contributing to motor accidents and associate them with severity of injuries.
4. To assess the availability of trauma personnel, equipment and supplies for management of accident victims in comparison with Ministry of health establishment.
5. To determine the percentage of patients contributed by motor traffic accidents in relation to other patients at Tumbi Hospital.

4.0 METHODOLOGY

4.1 Study area

The study was conducted in Kibaha District in Coast Region. The highway connecting the city of Dar es Salam to other up country regions crosses Kibaha and Bagamoyo districts. The total road network in the region is approximately 1187.0 kilometers. The stretch of highway in the Coast region covers 204 kilometers (CRREO-1999). The study covered the highway stretch between Mbwewe village (along Tanga road),Ubena Somozi village (along Morogoro road), and Kibamba village (along Dar es salaam road).The length of the road covered was 178 kilometers. This is approximately 87.3% of the total highway distance, and it is about 15% of the total Coast Region road network.

The long rain season in the region is from March to June and short rain season is from November to January and the rest are dry months. In 1998 and 1999 the total annual rainfall was 848.5mm and 903.8 mm respectively (KSRC-2000). Tumbi hospital in Kibaha Township is a Designated District hospital. It is the only hospital along the highway that provides emergency services to motor traffic accident victims.

4.2 Study design.

The study was descriptive, comprising of a cross sectional study design and a retrospective review of records of MVA. The first part was based on a review of records obtained from Coast Region Police and Tumbi hospital reports. Data were obtained from the annual and monthly reports for a four-year period time from

January 1996 to December 1999. The second part of the study was conducted by using a cross sectional design. Data was collected from motor related accident victims who were brought to hospital for a period of 7 weeks, starting from June 12th to July 31st, 2000.

Two field assistants assisted the Principal Investigator. Fieldwork was done for seven weeks and data analysis and report writing four weeks.

This study was for partial fulfilment of the requirements for the degree of Master of Public Health of the University of Dar es Salaam.

4.3 Data Collection

4.3.1 How Police Officers get information on MTAs:

Normally the police obtain information pertaining to motor traffic accidents from concerned travellers then they visit the site of accident. Following the report, two police officers visit the accident site together. At the site, they take measurement and enquire on how the accident occurred through different eyewitnesses to establish the cause of the accident. The information obtained is then written in a special police form. These forms are then kept at the police station for prosecution, record purposes and also for future utilisation in research and decision making on prevention of motor accidents.

Information obtained from police reports: -

The monthly and annual number of accidents –January1996 to 1999 (all reports).The class of persons killed or injured, time and weather condition during accidents, classes of vehicles involved and primary causes of road accidents.

The information collected from Tumbi hospital reports included:

Place of accident, date of accident, time of accident, type of vehicle, direction, number of people involved, and deaths: at site of accident and at hospital, age, sex and diagnosis.

A review of records was done systematically and all records were manually sorted out starting from 1996 to 1999.

Information from accident victims:

Each accident victim was interviewed after having his/her consent to participate in the study. A questionnaire with a total of twenty five questions was administered. Where the victim was not able to answer the questions because of his or her condition, surrogate information was obtained from a "helper" or anybody who brought him / her to hospital. Accuracy and completeness in filling of the questionnaire was checked everyday whenever there were accident victims attended.

Time spent on attending accident victims:

During the study period all motor accidents patients attending Tumbi hospital were followed up to record time of contact with medical personnel in the out patient and inpatient departments. Bed state was also recorded for the months of April, May and June, 1999 for the purpose of assessing the workload contributed by the accident victims.

Interview with hospital informants

Five Key informants from the hospital were interviewed. These were the Hospital Secretary, Matron of the hospital, Doctor in-charge of casualty Laboratory

Technician in-charge of the blood transfusion unit and the Radiographer in-charge of the X-ray department. Each key informant was interviewed separately using a structured interview questionnaire. Additional probing questions were also asked. The principal investigator himself conducted the interview. Each informant was interviewed on a different day following a scheduled appointment.

The questions asked were on:

Problems encountered in receiving motor accident victims, hospital supplies, staffing and record keeping. They were also asked to give their opinions on how to improve medical care to motor traffic accident victims in Tumbi hospital.

Interview with Traffic Police Officers

There was a questionnaire, which was intended to be administered to traffic police officers. The questionnaire contained questions aimed at getting information on how policemen collect road accident data, problems encountered in dealing with accidents and victims. It had also a provision for them to give opinions on how motor traffic accidents can be prevented in Kibaha. Unfortunately the Regional Traffic Commander filled himself the questionnaire on behalf of the other police officers on grounds that he was the only person authorised to serve as the spokesman of traffic police. His responses were taken as representing the opinions of the traffic police officers.

4.4 Data collectors

One research assistant was recruited from the police traffic department and the other one from the hospital. The research assistants were trained on how to extract relevant information systematically from traffic police and hospital reports. They were also trained on how to summarise/ compile their daily work. The training took four days. The two research assistants helped in sorting and recording information at the police station and at the hospital. The hospital's research assistant was also instructed to do close follow-up of referred cases to find out the final outcome on discharge.

4.5 Data analysis

The information was entered in a computer using EPI INFO-version 6 statistical software. The standard way tables were generated to examine the relationship between outcome variables of deaths, injuries, and disabilities with exposure variables of age and sex. Confidence interval for odds was calculated using a formula from Kleinbaum et al 1982. A P-value of 0.05 or less was considered significant. The results were also summarised to show trends and patterns of motor accidents from the year 1996 to 1999 in tables.

Hospital data on victims were also analysed by age, sex, and length of stay. The impact of accident victims to health care provision in hospital was calculated using the total number of patients' attendance of the hospital. Total casualty was calculated using the formula below:

Total casualty = persons injured + persons killed

4.6 Limitations

Though the recording system of motor traffic accidents in Coast region, police department and Tumbi hospital was expected to be good, some of the information was missing especially those pertaining to referred cases. Similarly those who were not seriously injured and decided to go away without reporting at any police station or hospital their records were also missing. At the hospital some accident forms were missing information on age of the victim, time of accident, type of the vehicle and direction on which the vehicle was going. Only a few accidents occurred during the study time, therefore types of injuries for analysis were very few.

One police officer on behalf of others was interviewed. This barred access to views from other police officers.

4.7 Ethical issues

The research proposal was presented at Institute of Public Health of the University of Dar es Salaam for approval. Then the authorities of the Public Health Institute were asked to write an introductory letter to the Coast region police headquarters and health authorities requesting them to allow the Investigator to have access to relevant records. The police and health authorities granted permission for this research. Accident victims were interviewed after they had given their consent. For ethical and confidentiality purposes names of accident victims and owners of the vehicles were not included in the data collection instruments.

5.0 RESULTS

POLICE DATA ANALYSIS

Table 1: Trend of motor traffic accidents along the Kibaha highway from 1996 to 1999

Year	No of accidents	Percent
1996	546	26.0
1997	524	24.9
1998	509	24.2
1999	523	24.9
Total	**2102**	**100.0**

Table 1 above shows the trend of motor traffic accidents along Kibaha highway from 1996 to 1999. Overall there was a total of 2102 accidents with an average of 525.5 accidents per year. The percentage of reported motor vehicle accidents (MVAs) was nearly the same over the four years suggesting a stabilising trend.

Table 2: Distribution of injured accident victims by sex from 1996 to 1999

Sex	1996		1997		1998		1999		Total	
	No	%	No	%	No	%	No	%	No	%
Male	515	80.5	507	82.2	596	78.8	451	76.7	2069	80.0
Female	125	19.5	110	17.8	160	21.2	137	23.3	532	20.0
Total	**640**	**100.0**	**617**	**100.0**	**756**	**100.0**	**588**	**100.0**	**2601**	**100.0**

Table 2 above shows that males were more involved in accidents (80%) than females (20%). In all four years the pattern was nearly the same. The commonest age group involved in MTA was 20-29 years followed by 30-39 years age group.

Table 3: Distribution of injured accident victims by age from 1996 to 1999.

Age group	1996		1997		1998		1999		Total	
	No	%	No	%	No	%	No	%	No	%
< 20	108	16.9	75	12.2	98	13.0	76	12.9	357	13.7
20-29	301	47.0	281	45.5	341	45.1	295	50.2	1218	46.8
30-39	153	22.0	221	35.8	252	33.3	166	28.2	792	30.4
40-49	36	5.6	31	5.0	53	7.0	43	7.3	163	6.3
≥50	42	6.6	9	1.5	12	1.6	8	1.4	71	2.7
Total	640	100.0	617	100.0	756	100.0	588	100.0	2601	100.0

The mean age of accident victims was 25 years, median 27years and range was 1 to 82 years.

Table 3 above shows that nearly 77% of accident victims were from the age group of 20 – 39 years, while 13.7% were below 20 years and 9% were 40 years and above.

Table 4: Distribution of Deaths caused by accidents in 1996 by age and sex

Age group	Males		Females		Total	
	No	%	No	%	No	%
< 20	34	2.5	1	5.9	4	2.9
20-29	50	41.7	7	41.2	57	41.6
30-39	45	37.5	7	41.2	52	38.0
40-49	16	13.3	0	0.0	16	11.7
≥50	6	5.0	2	11.7	8	5.8
Total	120	100.0	17	100.0	137	100.0

Table 4 above shows that 82.5% of victims who died were of age 39 years and below. The most affected age groups were 20 – 29 and 30 – 39 years. 120 out of 137 deaths (87.6%) were males compared to 12.4% among females.

Table 5 Type of Motor accident victims from 1996 to 1999

Categories	Number involved		Death	
	No	%	No	%
Pedestrians	471	15.3	215	45.6
Passengers	2325	75.3	268	11.5
Pedal cyclist	86	2.8	41	47.7
Motor cyclist	25	0.8	7	28.0
Drivers	181	5.8	41	22.6
Total	**3088**	**100.0**	**572**	**18.5**

Table 5 above shows that out of 3088 accident victims 572 (18.5%) died. Three quarters of the accident victims were passengers.

Of those who died (572), Pedestrians accounted for 37.6%, passengers 46.8%, Pedal cyclist 7.2%, motor cyclist 1.2% and drivers 7.2%.

Among the 86 pedal cyclists involved in MTAs, 41 (47.7%) died. While 215 (45.6) pedestrians out of 471 accident victims died. The lowest percentage of deaths occurred among passengers 11.5% (268/2325).

Table 6: Death rates of accident victims from 1996 to1999:

	1996	1997	1998	1999	Total
Number of victims	777	687	830	739	2601
Number of deaths	137	112	126	143	518
Deaths %	**17.6**	**16.3**	**15.2**	**19.4**	**19.9**

Table 6 shows that death rates of motor accident victims were 17.6%, 16.3% 15.2% and 19.4% for 1996, 1997, 1998 and 1999 respectively. This shows a decreasing and

increasing trend in death of motor accident victims. In all the 4 years studied, passengers contributed higher percentage of accidents victims, but they had the lowest death rate.

Records from police (see annex 7) show that in 1999 Coast region had a total of 630 accidents, 896 injured victims and 161 deaths. The study area alone contributed approximately 83% of all accidents, 82.5% of all injured victims and 88.8% of all deaths.

Table 7: Time and weather condition during occurrence of accidents from 1996 to 1999.

Road condition	Victim condition	Day time			Night time			Total		Odds Ratio (CI 95%)	p-value
		No. of accident	No. of victims	%	No. of accident	No. victims	%	No. of victims	%		
Wet	Survived	10	26	92.9	78	17	77.3	43	86.0	3.82 (0.66, 22.01)	0.11
	Died		2	7.1		5	22.7	7	14.0		
Rainy	Survived	71	154	90.6	62	152	74.9	306	82.0	3.23 (1.76, 5.91)	0.0001
	Died		16	9.4		51	25.1	67	18.0		
Dry	Survived	1099	1336	84.5	782	869	79.9	2205	82.6	1.37 (1.12, 1.68)	0.01
	Died		246	15.5		219	20.1	465	17.4		
All conditions	**Survived**	**1180**	**1516**	**85.2**	**922**	**1033**	**79.1**	**2554**	**82.8**	**1.52 (1.25, 1.85)**	**0.00001**
	Died		**264**	**14.8**		**275**	**20.9**	**529**	**17.2**		
	Total casualties		**1780**	**100.0**		**1313**	**100.0**	**3083**	**100.0**		

Table 7 shows the time and weather condition during accidents resulting in deaths and injured persons from 1996 to 1999. Most accident victims were injured when the road was dry (86.3%) than when it was wet (1.6%) or raining (12.10%).
More accidents occurred during daytime 1180 (56.1%). Driving at night compared to daytime was associated with a 52% increased risk of dying in MVA (OR = 1.52, 95% CI 1.25, 1.85 $X^2 = 19.6$).

Regardless of road condition victims were likely to die from motor vehicle accidents occurring at night compared to those occurring during the daytime 275/1313 (20.9%) and 264/1780 (14.8%) respectively, and the difference of 6.1% (95% CI 3.4%, 7.6%) was statistically significant ($p < 0.05$).

Driving at night while it is raining was associated with a three-fold increase of dying from a MVA than during daytime. (OR = 3.23, 95% CI 1.76, 5.91).

Road accident victims had a 37% increased risk of dying if the accidents occurred at night than during a day when the road was dry. The association was statistically significant (OR 1.37, 95% CI 1.12, 1.68).

Table 8: Number of accidents by vehicle type in 1998

Vehicle type	No	%
Buses	136	29.8
Lorries	166	36.3
Small vehicles	66	14.4
Other types of vehicles	36	7.9
Bicycles	38	8.3
M/cycles	15	3.3
Total	**457**	**100**

Table 8 shows the types of vehicles involved in MVAs. Lorries and buses caused Two thirds of the accidents. Lorries alone contributed 36.3% of MVA, followed by buses 29.8%. Motor cycles were least involved (3.3%).

Table 9: Causes of accidents identified by Police in 1998

	No	Percentage
Overtaking	48	12.4
Over speeding	133	34.3
Dangerous/careless driving	92	23.7
Mechanical defect	54	13.9
Crossing pedestrian	21	5.4
Crossing cyclist	9	2.3
Bad road	12	3.1
Obstruction	3	0.8
Intoxication	1	0.3
Animal astray	15	3.8
Total	388	100.0

Table 9 shows the various causes of accidents as identified by Police traffic in 1998. Three factors observed to contribute to road accidents in this area were over speeding (34.3%), dangerous / careless driving (23.7%) and mechanical defect of the vehicles (13.3%).

TUMBI HOSPITAL – DATA ANALYSIS

Table 10: The number of in patient beds in wards at Tumbi Hospital

Ward	No of beds	%
Medical	42	21.8
Surgical	26	13.5
Maternity	42	21.8
Casualty	8	4.1
Grade I and II	25	13.0
Pediatric	50	25.9
Total	**193**	**100.0**

Table 10 shows the total number of in patient beds at Tumbi hospital. The capacity of the hospital was 201 beds however 8 were out of order. Tumbi hospital had 193 in-patients beds, of which 13.5% were surgical beds.

Bed State in April, May and June 2000.

The bed state of the hospital during the whole period was as follows: The lowest bed occupancy in the hospital was 103 beds in April and the highest was 182 also in April. The bed state in surgical wards was as follows: The lowest bed occupancy was 12 beds and highest 26 beds. General observation in surgical wards was that males were two to four times more likely to be admitted than females. The surgical wards had bed capacity of 26.

Table 11: Hospital Medical personnel who have direct contact with patients

Cadre	Number present	Number required	Excess
Nurse assistants	106	25	81
Trained Nurses	54	43	11
Public Health Nurse	5	6	1
MCH Aides	8	0	8
Clinical Officers	16	13	3
Medical Officers	3	2	1
Surgeons	2	0	2
Laboratory Technicians	7	3	4
Radiographers	6	2	4
Assistant Medical Officers	7	7	0

Table 11 above shows that in each cadre there was excess except for Assistant Medical Officer's cadre.

Table 12: Number of health personnel allocated to surgical department at Tumbi Hospital.

Cadre	Number	Percent
Ward attendants	15	55.6
Trained Nurses	8	29.6
Clinical Officers	1	3.7
Medical Officers	1	3.7
Surgeons	2	7.4
Total	**27**	**100.0**

Table 12 shows that over half (55.6%) of the health workers in surgical department have not had basic training in clinical or nursing skills. Medical officers and surgeons accounted for 11% of the personnel in surgical department.

Table 13: Distribution of Casualty and OPD personnel at Tumbi hospital

Cadre	Number	%
Assistant Medical Officers	1	5.3
Clinical Officers	8	42.1
Trained Nurse/Nursing Officers	10	52.6
Total	**19**	**100.0**

Table 12 and 13 show personnel who very often work together in their daily duties. Accident victims are sent to surgical wards for admission from casualty or out patient departments.

Table 14 Tumbi hospital patients' attendance

Sex	Year			Total	Percent
	1997	1998	1999		
Females	29,320	48,690	42,205	120,125	51.2
Males	38,984	28,902	46,678	114,564	48.8
Total	68,384	77,592	88,883	234,689	100.0
Percent	29.1	33.0	37.8	100.00	

Table 14 shows total patients attended in three years (1997, 1998 and 1999) were 234,689. The total accident victims attended in the same three years were 1291. Therefore attendance of accident victims contributed 0.6% of all patients.

Assuming all injured persons recorded by police from the study area were attended at Tumbi hospital, their contribution to total attendance was approximately 0.9%.

Table 15: Age distribution of accident victims attended at hospital from 1996-1999.

Age group	1996		1997		1998		1999		Total	
	No	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
0 - 9	41	8.6	19	5.3	32	6.7	26	5.7	118	6.7
10 – 19	83	17.4	74	20.7	110	22.9	76	16.8	343	15.4
20 – 29	163	34.1	126	35.3	182	37.8	206	45.5	677	38.2
30-39	99	20.7	78	21.8	102	21.2	97	21.4	376	21.3
40 – 49	15	3.1	10	2.8	14	2.9	16	3.5	55	3.0
50+	8	1.7	7	2.0	10	2.1	6	1.4	31	1.8
Adults – age not indicated	69	14.4	43	12.1	31	6.4	26	5.7	169	9.6
Total	**478**	**100.0**	**357**	**100.0**	**481**	**100.0**	**453**	**100.0**	**1769**	**100.0**

Table 15 above shows that, between 1996 and 1999 a total of 1769 accident victims were attended. The total number of accident victims attended annually from 1996 to 1999 is almost constant and the age groups most affected were the same (20-29 and 30-39 years). The age between 20-39 years comprised 59.5% of all accident victims attended at Tumbi Hospital.

Table 16: Number of accidents by month as reported at Tumbi Hospital – 1999.

	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
No	8	8	17	13	12	20	15	14	22	11	14	12	166
%	4.8	4.8	10.2	7.8	7.2	12.0	9.0	8.4	13.3	6.6	8.4	7.2	100.0

Table 16 shows accidents occurrence by month as reported at Tumbi Hospital – 1999.

Months of June and September had highest motor accidents occurrence, which were 12% and 13.3% respectively. The months, which had lowest motor accidents, were January and February. Wet season (January and February) had lowest number of accidents. Number of accidents started to rise at the end of wet season and the highest was in September, which was in dry season.

Table 17: Referred Cases of motor accident victims to Muhimbili medical Centre

1996			**1997**			**1998**			**1999**			**Total**		
Vict. No.	Ref No.	%	Vict. No.	Ref. No.	%	Vict. No.	Ref. No.	%	Vict. No.	Ref. No.	%	Vict. No.	Ref. No.	
478	18	3.7	357	12	3.4	481	24	5.0	453	28	6.2	1769	82	

Table 17 shows the number of MVA victims referred to Muhimbili Medical Centre from 1996 to 1999, of all MVA victims (1769) attended at Tumbi hospital 82 (4.6%) were referred to MMC. The trend of referring accident victims increased annually from 3.7% in 1996 to 6.2% in 1999.

Table 18: Type of road accident injuries referred to Muhimbili Medical Centre from 1996 to 1999

Type of Injury	Number	Percent
Fracture of extremities	28	34.1
Fracture of spine	5	6.1
Fracture of ribs and clavide	5	6.1
Head Injury	20	24.4
Ruptured spleen / Liver	10	12.2
Severe crush / Cut wounds	7	8.5
Severe bleeding / Anaemia	4	4.9
Unknown	3	3.7
TOTAL	82	100.0

Table 18 shows that the most referred injuries were fractures of extremities (34.1%) and head injuries, which contributed 24.4%.

Table 19: The cause of motor accidents and severity of the injury on arrival at the hospital in 1999.

Cause	Total casualties		Deaths		Serious		Minor injury	
	No.	%	No	%	No	%	No	%
Pedestrian knocked	85	19.8	2	2.4	80	94.0	3	3.5
Overturn	173	40.2	5	2.9	127	73.4	41	23.7
Collision	101	23.5	7	6.9	79	78.2	15	14.9
Tyre burst/overturn	51	11.9	0	0.0	50	98.0	1	2.0
Falling from vehicle	7	1.6	0	0.0	7	100.0	0	0.0
Bicycles knocked	5	1.2	0	0.0	5	100.0	0	0.0
Motorcycles knocked	2	1.6	1	14.3	6	85.7	0	0.0
Unknown cause	6	1.4	0	0.0	6	100.0	0	0.0
Total	**430**	**100.0**	**15**	**3.5**	**355**	**82.6**	**60**	**14.0**

Table 19 shows that victims falling from a moving vehicle and pedal cyclists knocked down by vehicles had serious injuries compared to other causes of motor accidents.

Deaths occurred as a result of a pedestrian being knocked down (2.4%), or if a vehicle overturned (2.9%) and if the accident was due to a crash from a motor cycle or bicycle accident (14.3%).

Many casualties were mainly due to vehicle overturning (40.2%), or a vehicle collision (23.5%). Pedestrians knocked down and tyre bursts were also major factors contributing 19.8% and 11.9% respectively.

Table 20: Site of accident and number of accidents reported at Tumbi hospital 1996-1999.

Site of accident	Number of accidents	Site of accident	Number of accident
1. Kibamba	28	22. Mwendapole	8
2. Kiluvya	38	23. Chamakwesa	11
3. Maili moja	38	24. Mzenga	1
4. Tumbi	6	25. Chalinze	64
5. Picha ya ndege	37	26. Wami	36
6. Kwa Mathas	17	27. Lugoba	9
7. Kongowe	13	28. Msata	11
8. Mlandizi	38	29. Mbala	1
9. Ruvu	28	30. Kwalaza	1
10. Vigwaza	29	31. Mdaula	8
11. Visiga	35	32. Kidenge	1
12. Kwa Mfipa	5	33. Kibemwenda	1
13. Tanita	5	34. Ngerengere	1
14. Mkuza	5	35. Ubena	15
15. Miembe saba	4	36. Mbwewe	22
16. Mwadu	2	37. Not known	10
17. Kwale	1		
18. Mandela	2		
19. Mboga	4		
20. Msolwa	2		
21. Misugusugu	11		
Total			**584**

Table 20 shows that the most dangerous sites for MVA were Chalinze, 11% (64), Kiluvya 6.5% (38), Maili moja 6.5% (38), Mlandizi 6.5% (38), Picha ya ndege 6.3% (37), Wami 62.% (36) and Visiga 6.0% (35).

RESULTS OF THE CROSS SECTIONAL STUDY

The total number of motor accident victims attended at the hospital from the study area during the study period was 35. They comprised of the total number of accident victims attended at emergency room at the hospital during the study. The total number of accidents recorded was 16. One of the victims died on the way to hospital.

Table 21: Causes of accidents recorded during the study period.

Causes	Number	Percent
Pedestrians knocked down	4	25.0
Over turn	7	43.8
Tyre burst	3	18.8
Mechanical defect	1	6.2
Bicyclist	1	6.2
TOTAL	**16**	**100.0**

Table 21 shows that vehicle overturn was the main cause of casualties (43.8%) followed by pedestrians knocked down (25%).

Table 22: Treatment duration at the outpatient department.

Duration	**number**	**Percent**
30 min	12	34.2
1 hour	11	31.4
2 hour	8	22.9
> 2 hours	3	8.6
Not treated	1	2.9
Total	**35**	**100.0**

Table 22 shows that 34.2% of the victims were treated within half an hour and more than 60% were treated within one hour.

Social demographic characteristics of accident victims

Table 24: Age and sex distribution of the accident victims

Age group	Male		Female		Total	
	No	%	No	%	No.	%
< 20	2	50.0	2	50.0	4	11.4
20-29	13	86.7	2	13.3	15	42.9
30-39	6	75.0	2	25.0	8	22.8
40-49	3	100.0	0	0.0	3	8.6
≥50	3	60.0	2	40.0	5	14.3
Total	27	77.1	8	22.9	35	100.0

Table 23 above shows that the age groups of 20 – 39 years among the MVA victims was the one most affected (65.8%), followed by those in the age group of less than 20 years (11.4%).

Mean age of the victims was 30.9 years, median 29 years and range was 6 to 60 years. It also shows that overall males were more involved in accident (77.1%) than females (22.9%).

The proportion of male involvement in accidents was consistently high in all age groups except in age group below 20 years.

Table 24: Education level of accident victims

Level of education	Number	Percent
Illiterate	2	5.7
Primary School	27	77.1
Secondary School	4	11.4
Higher education	2	5.7
TOTAL	35	100.0

Table 25 shows that 77.1% of the accident victims were primary school leavers. Very few were illiterate (5.7%).

Table 25: Residence and occupation of the accident victims

		number	Percent
Occupation	Peasant	11	31.4
	Employed	6	17.1
	Business	9	25.7
	Others	9	25.7
Residence	Rural	11	31.4
	Urban	24	68.6

Table 25 shows social demographic characteristics of accident victims.

Urban residents represented 68.6% of the accident victims and rural residents 31.4%. Peasants were the most affected group (31.4%) while employed individuals were least involved (17.1%).

Table 26: Day of the week accident occurred.

Day	number	Percent
Monday	1	6.7
Tuesday	1	6.7
Wednesday	3	20.0
Thursday	3	20.0
Friday	2	13.3
Saturday	2	13.3
Sunday	3	20.0
Total	**15**	**100.0**

Table 26 shows day of week accident occurred.

Wednesday, Thursday and Sunday had the highest frequency of motor vehicle accident occurrence each contributing about 20% of the accidents.

Length of stay in the hospital:

Many victims spent a day or less in the hospital. 80% of them stayed for 2 or less days. Only one victim stayed for 12 days (2.9%).

Time elapsed after accident before the victim was brought to hospital:

14 victims out of 35 (40%) were brought to hospital within an hour occurrence of the accident.

15 out of 35 victims (43%) were brought to hospital more than 2 hours after occurrence of the accident.

Table 27: Waiting time at the hospital before treatment.

Waiting time in minute	Number	Percent
≤ 5	16	47.1
10	7	20.6
15	1	2.9
20	3	8.8
30	4	11.8
≥ 45	3	8.8
TOTAL	**34**	**100.0**

Table 27 shows that 70.6% of the motor accident victims were treated within 15 minutes after arrival at the hospital. Only 8.8% stayed for more than 45 minutes at the hospital before being attended to.

Table 28: Class of the injured victim.

Class	No	Percent
Driver	1	2.9
Passenger	25	71.4
Pedestrian	4	11.4
Motor cyclist	0	0.0
Pedal cyclist	1	2.9
Other	4	11.4
Total	**35**	**100.0**

Table 28 shows motor accident victims were predominantly passengers, who contributed 71.4% of all the victims followed by pedestrian (11.4%).

Table 29: Type of vehicles involved in the accidents

Type of vehicle	number	Percent
Saloon car	4	25.0
Bus	4	25.0
Lorry	4	25.0
Motor cycle	0	0.0
Bicycle	1	6.2
Others	3	18.8
Total	**16**	**100.0**

Table 29 shows that it is saloon cars, buses and lorries that were commonly involved in MVAs. Motorcycles and Bicycles were least involved (0% and 6.2% respectively).

Condition of the road:

76.5% of the victims were aware of the condition of the road, and 23.4% were not aware of the condition of the road during the accident.

Buses knocked down 40% of the pedestrians while 20% of pedestrians did not know what vehicle knocked them.

FIRST AID AFTER ACCIDENT

There was no first aid given to all accident victims before they were brought to hospital. 94.3% of all motor accident victims were brought to hospital by vehicles of other travellers. Only 0.7% were brought by a Police vehicle.

Table 30: Time the accident occurred.

Time	number	Percent
18hrs– 05hrs	4	25.0
6hrs – 17hrs	12	75.0
Total	**16**	100.0

Table 30 shows that most of the motor accidents occurred during the day (75%). During the night only 25% of the motor accidents occurred.

Fully recovery occurred in bruises, sprain soft tissue injuries, few cut wounds, and tooth injury and fractures mostly caused temporary disability. None of the victims was permanently disabled.

Table 31: General condition of the accident victims

Comment	Number	Percent
Recovered	11	31.4
For re-attendance	2	5.7
Improved	18	51.4
Referred	3	8.6
Died	1	2.9
Table	**35**	**100.0**

Table 31 shows general comments/opinion given on the condition of victims during discharge of accident victims from the hospital. 8.6% of motor accidents with fractures were referred to a consultant hospital and 51.4% of the victims were discharged after satisfactory improvement.

Table 32: Sex and outcome of the injuries

Sex	Full recovery		Temporary disability		Death		Others		Total	Percent
	No	%	No	%	No	%	No	%		
Male	7	25.9	5	18.5	1	3.7	14	51.9	27	77.1
Female	2	25.0	4	50.0	0	0.0	2	12.0	8	22.9
Total	**9**	**25.7**	**9**	**25.7**	**1**	**2.9**	**16**	**45.7**	**35**	**100.0**

Table 32 shows that proportion of female victims with temporary disability on discharge from the hospital were higher (50%) than males (18.5%).

Approximately 26% of the victims in both sexes reported a complete recovery.

Table 33: Type of motor related injuries.

Type of injury	Frequency	Percent
1. Fractures	5	14.3
2. Head injury	7	20.0
3. Intraperitonial haemorrhage	1	2.9
4. Soft tissue injuries	15	42.8
5. Body pain	7	20.0

Table 33 shows that the most frequent type of motor related injury was soft tissue injury (42.8%) followed by head injury and body pains, which had 20% each.

Table 34: Severity of the injuries

Severity	number	Percent
Death	1	2.9
Serious injury	18	51.4
Minor injury	16	45.7
Total	**35**	**100.0**

Table 34 shows severity of injuries. 51.4% of the victims were seriously injured, and one victim died (2.9%)

Outcome of the injuries after treatment:

25.7% recovered completely

25.7% had temporary disability

45.7% needed follow up, referral or further treatment.

Type of injury and age of the victims:

All head injuries were between the age of 20 and 49 years.

Other types of injuries were scattered in different age groups without any clear pattern.

Table 35: Age of the victims and severity of injury.

Age groups in years	SEVERITY						
	Death		Serious Injury		Minor Injury		Total
	No.	%	No.	%	No.	%	
< 20	0	0.0	3	75.0	1	25	4
20 - 29	1	6.6	7	46.7	7	46.7	15
30 - 39	0	0.0	3	37.5	5	62.5	8
40 - 49	0	0.0	2	66.7	1	33.3	3
≥ 50	0	0.0	3	60.0	2	40.0	5
TOTAL	**1**	**2.8**	**18**	**51.4**	**60**	**45.7**	**35**

Table 35 shows that serious injuries were more (51.4%) than minor injuries (45.7%). Deaths occurred in only one of the victims.

The 30-39 years age group had a highest percentage of minor injuries (62.5%) than in other age groups, while the age group above 40 years and below 30 years had highest percentage of serious injuries.

Interview with hospital informants

The interview was conducted among five people including Hospital Health Secretary, Matron of the hospital, Doctor in-charge of the casualty, blood bank in-charge, and X-ray dept in-charge.

1) All of them indicated that motor traffic accidents were a serious public health problem in Kibaha requiring attention.
2) The hospital was not designed to handle many accident victims at a time. It did not have enough supplies and equipment e.g. Suction machines etc.

3) Orthopaedic specialists were required.

4) In the X-ray department there was a shortage of cassettes, films and chemicals. When shortage was acute, all accident victims requiring radiographs had to be referred to Muhimbili Medical Centre in Dar es Salaam. The X-ray staff felt that the department was located far away from the casualty department therefore causing problems in delaying victims on the way.

5) Laboratory services:

There was low capacity of blood storage facilities therefore due to these problem accident victims sometimes were to be referred for just blood transfusion.

Sometimes the laboratory ran short of HIV checking reagents. This lead to stoppage of blood transfusion services.

The blood transfused was checked for HIV and VDRL only. Other infectious diseases like hepatitis and malaria were not checked.

The room for blood transfusion services was found to be too small. This small room was used for screening, cross matching, and donation, as office and storage of blood. The in-charge of this section felt that at least 3 rooms were needed for an office, blood donation and blood storage.

The section had only one staff, therefore more staff were needed. Also the in-charge felt that in that section there was need to have staff who knew how to persuade people to donate blood and also who have had training in HIV counselling so as to counsel donors found to be HIV positive or those who need to know their sero-status.

6) All the interviewed individuals felt that there was no problem with data collection and keeping of accident records.

7) Co-operation with traffic Police in handling motor accident victims was mentioned to be generally good and that it should be sustained.
8) Opinions on how to improve services to accidents victims, they mentioned that The emergency unit should be improved; All important equipment, instruments and supplies should be made available. They also stated that emergency preparedness training for all hospital staff should be considered. To minimise unnecessary referral of accident victims, they also suggested that an Orthopaedic unit should be established.

The interview with traffic Police

According to the Tanzania Police regulation, only an authorised personnel is allowed to give information concerning police matters outside the police circles. Due to this problem the investigator had to allow the Regional Traffic Police Commander to fill the questionnaire on behalf of all traffic police in Kibaha office.

The Responses:

1.The Police force felt that the number of motor traffic accident in Kibaha was not alarming. The problem was considered to be similar to other regions in Tanzania.

2. Information on Accidents: People involved in accident report themselves to police but other road users also help in reporting. Usually the Police get information on accident occurrence promptly.
3. First Aid: The only first aid given to accident victims was reported to be lying them down properly for transportation.
4. Accident victims are sent by police vehicle to hospital

5. All victims who die at the site are sent to hospital first before the bodies are released to relatives.
6. In handling accident victims they protect themselves with gloves
7. The accidents (motor) records are reliable and well kept.
8. Recommendation/opinion on how to reduce accident:
   - Passengers should be motivated not to board a vehicle, which has exceeded its passenger carrying capacity (to avoid overloading).
   - Report over speeding drivers to police immediately (advice to passengers).

6.0 DISCUSSION

The present study has demonstrated patterns and trend of motor traffic injuries and their impact in health services in Kibaha district. This was made possible by using data and other information from police and Tumbi hospital. As it has been mentioned in other studies, prospective studies have problems in having standardised record keeping (Bener et al 1992), and also having complete records. Usually the records are kept for the purpose of use in that particular office and therefore it is not uncommon to find that they do not exactly fit the study.

In this study some information was also missing because not all individuals involved in motor accidents reported to police or hospital. Accident victims who are severely injured or dead could not co-operate in giving the required information and hence the information is lost. This was similar to what was reported in other studies (David 1991).

Police data

Trend of motor accidents

The trend of motor traffic accident along the Kibaha highway has stabilised for the past four years (1996 to 1999). The striking thing is that it is consistently high. The contribution of this stretch to the total motor accidents in the region was also very high. In 1999 it contributed 83% of all accident, 82.5% of all injured victims and 88.8% of all deaths. The alarming high road accidents may be attributed to the heavy traffic on the high way caused by vehicles going and coming from upcountry and neighbouring countries. Probably the stabilisation is

made possible by traffic police who for all these years were always found in several places on this road enforcing the regulations and also the introduction of vehicle speed governors in all public buses. There is likelihood that in the near future the trend may start going down slowly if the same effort will be maintained. The high frequencies of accidents in this small stretch of road in conjunction with mass media coverage have raised a public concern.

Age and sex distribution

The age and sex distribution of victims, have the same pattern in injury and death victims. In all the four years, more males were injured and compared to females. The age group of 20 to 39 years was mostly affected. In 1996 the results revealed that 89.9% of those who died were below age of 40 years. In the same year 87.6% of all deaths reported were contributed by males against 12.4% females' deaths. The general observation was that males were more involved in road accidents because they travel more in their daily duties compared with females who usually stay at home doing domestic duties. These findings were consistent with other studies (Bener et al) that the majority of victims were males under the age of 35 years.

Categories of motor accident victims

Motor accident victims were categorised into five main groups of road users namely Pedestrians, passengers, pedal cyclists, motor cyclists and drivers.

Among the road users passengers had higher proportion of involvement in motor accidents but had the lowest death rate. The death rates were 11.6%, 9.9%, 9,9% and 15% in 1996, 1997, 1998 and 1999 respectively.

The road users who are always in danger were motor cyclists. In 1996 pedal cyclists and pedestrians had the highest death rate, 64% and 43.8% respectively. In 1997 the same groups had again highest death rates with 100% of motor cyclists involved in MVA dying. The small number of them being involved in the accidents might contribute to this. Usually the population of motor cyclists on the highway is very low compared to other road users. In 1999 pedestrians had the highest death rate (38.3%), followed by motor cyclists (25%) then pedal cyclists (17.9%). These findings support other studies indicating that pedestrians, pedal cyclists and motor cyclist had higher death rates than road users. In a study done by Kent at al in Sweden reported that pedal cyclists contributed 38.9% and pedestrians contributed 29% of all deaths (Kent 1991). A study done in Kenya reported that vehicle pedestrian collisions were most severe and pedestrians accounted for 42% of all deaths due to motor accidents (Odero 1995). Severe collisions were also reported in this study too because vehicles on the highways often travel in high speed. When a collision occurs between a vehicle and a pedestrian, pedal cyclist or motor cyclist the impact to the accident victim is usually very severe and most of the time the outcome is expected to be death or permanent disability.

Causes of accidents:

Three factors were observed to contribute more in road accidents in this area. These included over speeding (34.3%), dangerous / careless driving (23.7%) and mechanical defect of the vehicles (13.9%). Over speeding is also mentioned in other studies as a major contributing factor on road crashes and subsequent injury to persons and property damages (Shibata et al 1994). General observation showed that good road encourages drivers to over speed, which in turn result into increased accident occurrence. Asogwa (1992) reported same findings.

Type of vehicle and contribution to accidents

The analysis done for the year 1998 on contribution to accidents by different type of vehicle revealed that lorries had highest frequency of being involved in MVA (36.6%) followed by buses (29.8%). Motor cycles contributed the least proportion (3.3%). These largest percentages are probably due to the fact that most of the vehicles on this highway are lorries and buses going to or coming from upcountry and neighbouring countries. The results are similar to other studies (Luby et al 1997) where they reported that buses and trucks were highly involved and caused 46% of all injuries and 51% of all deaths.

Time and weather

Most of the accidents occurred when the road was dry (86.3%) than when the road was wet (1.6%) or raining (12.1%). The study also revealed that 56.1% of accidents occurred during the day while 43.9% occurred during the night. The results do not support the finding of previous study (Ayuthya et al 1997) which

reported that about 90% of all traffic accidents occurred during the rainy season and mainly at night. May be in the other study there were different environmental factors operating during rainy season like fog which reduce visibility and probably the roads were slippery. The high number of motor accidents in Kibaha during the day may be explained by the fact that buses are not allowed to travel during the night and therefore there is congestion of vehicles during the day, which leads to increased chance of road accidents occurrence.

Victims were likely to die from motor vehicle accidents occurring at night-time than those occurring at daytime 20.9% and 14.8% respectively.
The study also revealed that victims were more likely to die from road accidents occurring at night-time when the road was dry than at day time when the road was also dry.

The possible explanation of increased risk of dying during the night following a MVA is that it takes longer time for the victims to be transported to hospital due to low traffic flow, and therefore delayed rescue and first aid. Due to visibility problems also it may take time to locate all injured victims in time. Another reason might be that defective vehicle and incompetent drivers operate during the night to avoid traffic police who usually do not operate at night.

HOSPITAL DATA

Tumbi hospital as a district hospital is having more beds and staff than required in the establishment by the Ministry of Health. However there is a provision that the required number of nurses of any district hospital will depend on the bed capacity of that particular hospital. Also in case of absence of public health nurses, MCH-Aides can cover the gap. This provision does not mention anything about excess number of other cadres. In addition to these staff there are also clinical officers students working hand in hand with the employed staff in providing services.

The bed stet of the hospital for three consecutive months, April, May, and June was recorded to determine the hospital bed occupancy rate. The lowest occupancy rate recorded was 103 beds while the highest was 182 beds. This means that in this hospital there were 103 beds, which had patients everyday. In surgical wards the general observation was that males were always two to four times higher than females and the lowest bed occupancy was 12 beds and highest occupancy was 26 beds. The surgical ward had a capacity of 26 beds. According to this observation in surgical wards it means that there were times when extra beds were required.

Another observation is that in male wards the beds were always fully occupied and almost always patients shared beds in twos while in the female wards many beds were empty. Acute shortage of bed in surgical wards was experienced when frequency of admission of accident victims increased.

Since it is not possible to transfer male patients to female wards then a possible arrangement was to have a male ward with double capacity of beds compared to that of females. Other alternatives suggested by Asogwa (1978) are to allocate more beds to a department that is dealing or admitting more patients and improving the quality of care so that patients do not stay long in hospital. Another solution is to improve quality of care in peripheral hospitals. This would reduce the number of referral cases to this hospital.

According to this analysis Tumbi hospital has more than enough staff and beds. What is needed is proper organisation and management of these resources. The burden of patients contributed by motor traffic accident from the study area was 0.6% of the total attendance. If the number of accident victims from other areas outside study area attended in this hospital were included the percentage contributed would be expected to be a little bit higher. Assuming also all injured victims recorded by police had attended at Tumbi hospital the proportion of contribution would increase to 0.9%.

The reason given as to why 9.6% of the victim's ages were not recorded is that the victims were not co-operative following serious trauma. Another possibility could be that sometimes if the clinicians or nurse on duty is busy he/she may just put down the age as "child" or "adult" and continue with management of the patient, an activity that is more important to the patients at that time. However, in order to know and have a track on the trend of individuals more affected for

proper control measures of the target group there is need to emphasis on registering ages. If not possible to ask the victim as in death an estimated age can serve the purpose.

Accidents occurrence by month as reported at Tumbi hospital in 1999 showed that the month of June and September had the highest frequencies of 12% and 13% respectively. The months, which had lowest motor accident, were January and February. The reason for having a low number of accidents during the rainy months of January and February might be because drivers are more careful, or they are afraid of slippery roads. In the dry season (September), drivers might feel less dangerous not to observe driving rules and therefore drive carelessly leading to more accidents happening.

The seasonality of accidents was also reported by other studies (Kong et al 1996, Jegede 1988) that most of accidents occurred during the month of October to December.

The trend of referring accident victims was increasing annually from 3.7% in 1996 to 6.2% 1999. Since the number of victims attended each year were not increasing,, the increased referrals could be due to increased serious cases which needed referral or the personnel in surgical department of the hospital had decided to reduce the burden of managing accident victims by referring most of them even those who could be managed at the hospital. Among the referred cases fractures contributed 46.3%, therefore establishment of orthopaedic section could reduce many referral. The shortage of supplies and other resources like X-rays films, blood for transfusion

might also led to more referrals. Finding remedy to the contributing factors can reverse this trend. Further investigation is suggested to confirm the reasons for increasing referrals.

Causes of motor accident and severity of injuries on arrival at the hospital in 1999 were analysed and found that serious injuries contributed 82.6%. Generally the study revealed that all road related accidents might lead to serious injuries.

Victims falling from moving vehicle and pedal cyclists knocked by vehicles all times resulted to serious injuries. But since the number of victims involved was small to potentiate the observation a bigger sample of Pedal cyclist victims is needed.

Site of Accidents

The sites (locations) with high frequencies of motor accidents corresponded with those of police records. The combined report of 4 years revealed the following areas as more prone to accidents. Chalinze, Maili moja, Kiluvya, Mlandizi, Pichandege, Wami and Visiga. The possible explanation as to why these areas had high frequency of accidents is that these areas are located in small townships with high population density where vehicles stop for refuelling or passengers recreations. Therefore many accidents occur when careless drivers enter the highway from these towns or pedestrians doing pet businesses cross the road carelessly. Also intoxicated drivers and pedestrians might influence this. At Wami river, the reason might be

different, as there is no township. The steep hill and sharp corners might contribute to the high frequency of accidents in this area.

A map showing most of the affected locations is attached as appendix 6. The areas, which had high number of accidents, were not necessarily having high number of accident victims. For example at Maili moja 38 accidents occurred but victims were only 98, while at Visiga there were only 35 accidents but the victims were 149. These differences are usually contributed by cause of the accident and the number of passengers in the vehicle involved. This phenomenon is also explained in other studies (Graham 1993). Injury rate also depends on the size of the vehicle. Accidents involving smaller vehicles than larger ones were more likely to result in a proportion of injured victims (Leon 1993). Proneness of a locality to accidents is also reported in other studies (Graham 1993).

Cross-sectional study

During the study period, a total of 35 accident victims were attended at the hospital. The 35 victims were a result of 16 road accidents, which occurred during the study period. Treatment duration at outpatient department showed that 34.3% were treated within half an hour and more than 60% were treated within one hour. The difference on treatment time depended on the type of management of different injuries. Patients with minor injuries were in the 34.3%.

Regarding the police data, analysis showed similar results for age distribution of the accident victims.. More victims (54.4%) were from the age group 20-34 years.

Length of hospital stay

68.6% of the victims spent a day or less in the hospital. Only one victim stayed for 12 days (2.9%). These figures does not agree with another studies (Asogwa 1978) which reported that 50% of road traffic accidents spent 10 days or less in hospital and 21% over 30 days and 29% spent between 11 and 30 days in hospital. The reason for this short stay of patient at Tumbi hospital might be contributed by high referral rate observed. In this study the low number of accident victims studied might also contribute to the results.

Time elapsed after accident before the victim was brought to hospital was that 14 (41.2%) were brought to hospital within an hour after accident and 15 victims (44.1%) were brought to hospital in more than 2 hours. In case of severe injuries, which needed immediate attention, the 41.2% individuals stood a better chance of survival than the 44.1% who were brought 2 hours after they had been involved in an accident.

Victims were brought to hospital late because of several reasons including distant locations and lack of reliable transport. To reduce this problem the idea of strengthening other health centres along the highway could be of help. Also increasing police patrol with reliable transport.

In this study only 16 accidents occurred with saloon cars, buses and lorries having same frequency of 25%. Passengers contributed 71.4% of the victims, which was the

highest, and pedestrians 11.4%. In this study peasants were the more affected group (31.4%) and employees 17.1% probably this was contributed by a bus involved in the accident which was from the rural villages of peasants in a nearby district. In another study done by Wang (1997) reported similarly result to our study that majority of the victims were peasants (55%) and workers (19%).

Day of accident

Wednesday, Thursday and Sunday were the days when most of the motor accident occurred with 20% occurring on each day. Monday and Tuesday had least frequency (6.7%) of accident occurrence. Further investigation is needed to find out the reason for high and low frequencies of accidents in specific days of the week. Most of the accidents occurred during the day (73.3%). The study by Graham (1993) also reported that motor accidents occurred at certain hours of the day and week.

Availability of first aid services

All the MVA victims brought to Tumbi hospital were not provided with any first aid before arrival (100%). This includes the two traffic police subjects who were involved in an accident were brought to hospital by their fellow policemen without any first aid given. This reveals that there is a serious problem that needs to be solved. Drivers, policemen and ambulance crew require knowledge on how to give first aid so as to improve the prognosis of the victims. This suggestion was also given in other studies (Asogwa 1978, Mhina et al 1993, Shibata et al 1994).

Type of accident injury as related to survival status of the victims

Full recovery in a very short time occurred in victims with bruises, sprain and soft tissue injuries. Patients with intraperitonial haemorrhage were seriously injured and admitted for longer time (12 days) followed by head injury patients who were discharged after 5 days of admission. Three patients with fractures of femur, humerus and ribs were referred to Muhimbili hospital and one patient with head injury died. This report reveals that the life threatening injury ie. Include head injuries, followed by intraperitonial haemorrhages. Bruises and Sprains are not life threatening.

Sex and outcome

Females with temporary disability were disproportionately more (50%) than males 18.5%. Approximately 25% of the victims in both sexes recovered completely. This shows that the recovery rate was similar in both sexes but this also depends of the type of injury.

Type of motor related injury

The most common type of motor related injury was soft tissue injury (22.9%) followed by cut wounds (17.1%) and head injury was 17.1%. In this analysis, only the most severe injuries were recorded. This means that if individual has multiple injuries only one type of injury was recorded. The study done by Asogwa (1978) reported that the head was the commonest part of the body involved in MVA followed by lower limbs, upper limbs, chest and the pelvis. He also reported that 35% of the victims had multiple injuries.

Severity of injuries

Few one percent (51.4%) of victims were seriously injured and one victim died. According to the results it shows that the two categories of serious injury and minor injury are not enough classification. Another class in between of moderate injury could serve to reduce the percentage of serious injury. It is not true that every individual with any type of fracture is a serious injury. Similarly in another study (Andrews et al 1999) reported that over half of the accident victims required admission and 1.4% died in the casualty department.

Outcome of injuries

Few individuals recovered completely during discharge (25.7%) and another 25.7% had temporary disability. A large proportion 45.7% needed follow up, referral or further treatment. It was not possible to do follow up for the 45.7% up to full recovery. But follow-up was important because some individuals could have developed permanent disability, which at discharge could not be predicted.

In-depth interview with hospital informants

According to the responses there was an indication that many problems mentioned could be solved by the management of the hospital and others needed the RMO's and Ministry of Health's attention. The question of supplies and provision of rooms for blood bank can be solved by management. Supplies need to be ordered before the stock is finished

Interview with Traffic Police

The responses given byTraffic Police Officers that accident in Kibaha is a usual problem like in many other Regions was supported by the fact that Kibaha Region ranked the sixth in 1999 in having large number of motor accidents (See annex 7). The other regions, which had larger number of accidents, were Dar es Salaam, Mbeya, Morogoro, Kilimanjaro, and Tanga in descending order.

He mentioned that they (Police) give first aid to victims and also wear gloves when handling victims. General observation in this study was that there was no first aid given to accident victims and the police did not protective gears such as gloves at the accident sites. Therefore they needed more knowledge on hazards of handling accident victims without gloves.

About record keeping there was doubt that they were missing some of the information after the accident has occurred because it depends on how much the victims will volunteer to give. For example a driver of an over crowded bus involved in an accident might give false number of passengers who were in the bus especially if most of them escaped unhurt. Therefore this area needed further investigation to find out how much information is lost and suggest ways of improving police data collection in Tanzania.

The recommendation that was given by police on how to reduce motor accidents indicated the to educate and motivate passengers or communities to refrain from boarding a vehicle that is full of passengers so as to avoid overloading. The vehicles

with many occupants tend to increase the risk of getting a MVA. This observation was also mentioned in other studies (Graham 1993). Other recommendation given was to report over speeding drivers to the Police. This recommendation is good but the practicability is doubtful, as it is not easy for another driver in another vehicle to stop at a police station and report such a situation. Probably with increased use of cellular phones, more information may be communicated to the police with regard to accidents and over speeding.

The previous studies (Jayasuria 1991, Graham 1993, and WATB 1992) suggested use of proven effective measures such as behavioural interventions, tightening regulations and targeted media campaigns at community level, which can help in preventing or reducing motor accidents. These measures need further studies in our local situation to know which ones are more effective. We also need to build on what the police have suggested, because they have the potential to serve as implementers of the suggested recommendations.

7.0 CONCLUSION

The study has revealed the pattern and trend of motor traffic accidents in Kibaha district from 1996 to 1999. It has also revealed that young males aged between 20 and 39 years that are economically active are highly prone to motor traffic accidents. The road users who are always at risk of dying on the road were found to be pedestrians, pedal and motor cyclists. Passengers were found to have low death rates in all the four years. The trend of accident occurrence was almost the same with small fluctuations for the whole period studied.

The study also revealed that the risk of dying if one is involved in an accident during the night was significantly higher than during the day, especially when it was raining. The study has also described different types of motor related injuries and the survival status of the accident victims. It revealed that life threatening conditions were intra-peritonial haemorrhage and head injuries.

Age, sex, over speeding, reckless driving, being a pedestrian, or a motor cyclist were identified as risk factors to motor accidents but there was no association with severity of injuries. The interview has revealed that most of the referred patients could be managed well in the hospital if supplies were maintained.

According to the Ministry of Health staff establishment, Tumbi hospital was found to have adequate trauma personnel as a district hospital. It has more than enough qualified medical personnel Availability of orthopaedic equipment and instrument would improve the care and survival of accident victims. Inadequate supplies were

mentioned to be a problem but it was found that it could be solved locally by prompt requisition of supplies and equipment. The management is advised to plan in advance the strategies for getting finances so as to improve motor traffic accident injuries management.

The study showed that motor traffic accidents accounted for 0.6% of admission at Tumbi hospital. This is a big burden to the hospital resources because the national policy on accident victims is that they are exempted from paying. Suggestion for the Ministry of Health is to give subsidies to this hospital so as to reduce the financial burden.

8.0 RECOMMENDATIONS

1. The hospital staff should be considered for intensive training on emergency preparedness. They should be also motivated to care for the accident victims.
2. The hospital should establish a full equipped and staffed Orthopaedic section.
3. The traffic Police, ambulance personnel and hospital staff especially those in casualty section should be trained on how to give first aid to injured people and how to handle different types of injuries while transporting them to hospital.
4. The hospital and police data collection and record keeping should be strengthened.
5. Drivers should be educated on the dangers of driving at night especially when it is raining.
6. There is need to promote public awareness on road safety through public information and media campaigns. This should be a continuous process rather than implementation on special days as it is currently done.
7. There should be a strategy of improving drivers' competency and enforcement of road safety regulations. Regulations and their corresponding penalties also should be reviewed regularly.

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