PREVALENCE AND RISK FACTORS FOR CEREBRAL PALSY: A CASE OF MBEYA ZONAL REFERRAL HOSPITAL

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CERTIFICATION

The undersigned certifies that he has read and here by recommends for acceptance by the Open University of Tanzania a thesis entitled õassessment of prevalence and risk factors for cerebral palsy: A case of Mbeya zonal referral hospitalö in partial fulfilment of the requirements for the award of Masters of Science in Biology of the Open University of Tanzania.

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Date

DEDICATION

This work is dedicated to God the Almighty. He is the one who has enabled me to accomplish this research work.

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Glory be to God for His tender and kindness for he has enabled me to pass through challenges while I am working with this work.

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ABSTRACT

This study aimed at evaluating the prevalence and risk factors associated with cerebral palsy at Mbeya zonal referral hospital. Specifically the study aimed at establishing the prevalence of cerebral palsy in the study area, determining the risk factors for cerebral palsy in children at the study area and determining the challenges faced by medical personnel while handling cerebral palsy in children at the study area. The study used a descriptive quantitative research design where cross-sectional survey was applied while data were collected using self-administered structured questionnaire. Descriptive statistics and logistic regression analysis were utilized to analyse data from 120 individuals obtained through simple random sampling. The results established that the prevalence of cerebral palsy in the study area is 17.77 per 1000 live births. The logistic regression analysis revealed that the risk factor associated with cerebral palsy at Mbeya zonal referral hospital was neonatal seizures at significant level of $p=0.005$ and $OR=0.158$. The challenges facing medical personnel during handling cerebral palsy patients include few experts, inadequate facilities, low income among parents and care givers, poor nutrition and lack of education. The study concludes that neonatal seizures were the major cause of cerebral palsy in the study area. Thus, it is recommended that the government should establish a well-equipped neonatal intensive care and intensive physiotherapy units at all zonal hospitals including Mbeya zonal referral hospital as well as increasing the number of experts to adequately handle CP patients in the zone. In addition it is suggested that improvement of antenatal and perinatal care is important in the reduction of the incidence of cerebral palsy.

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LIST OF ABBREVIATIONS AND ACRONOMYS

ACPR   Australia Cerebral Palsy Register report

CP   Cerebral palsy

DST   Dynamic system theory

OR   Odd Ratio

ToM   Theory of mind

SRS   Simple random sampling

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Cerebral palsy (CP) is one of the most common sources of disability among children in developing economies and often linked with poor growth (Adekoje, T. O., Ibeabuchi, M. N. & *Lesi, F.E.A.* (2016). It is also one of the most common sources of motor deficiency in childhood both in developed and developing world (Kent, 2013).

Globally, the overall CP prevalence has remained unchanged with 2.11 per 1000 live births despite survival improvement at-risk preterm infants (Oskoui *et al*., 2013). However, the rate of CP differs within and among countries, for example in USA, the CP prevalence was 2.6 per 1000 in the National Survey of Children's Health (NSCH) and 2.9 per1000 live birth in the National Health Interview Survey (NHIS) (Maenner *et al.,* 2016). In Quebec, Canada, the overall prevalence of CP was 1.84 per 1,000 live birth children aged 9-11 years in 2010 (using a frequentist approach) and was 2.30 per 1,000 children while utilizing a bayesian approach (Oskoui *et al*., 2013).

On the other hand, the Australian Cerebral Palsy Register report (ACPR) in 2013 revealed that there were 3135 people with CP on the population register. Out of these individuals, 5.6% had their brain injury occurring more than 28 days after birth with a prevalence of 2.1 per 1000 live births whereas the remaining 94.4% of individuals had their brain injury occurred during the prenatal and perinatal period of infant development and with a prevalence of 2.0 per 1000 live births.

However, as to majority of pediatric neurologic conditions, very little has been published on CP in the African countries (Burton, 2015; Donald *et al.*, 2015; Kakooza-Mwesige *et al.*, 2015). Large gaps remain in the knowledge of CP aetiology across the continent, its risk factors, even its prevalence information vital to the development of prevention strategies (Burton, 2015). Basic care is limited by the poor availability of diagnostic facilities or medical personnel with experience and expertise in managing cerebral palsy, exacerbated by absence of available interventions such as medications, surgical procedures, or even regular therapy input (Donald *et al.*, 2015).

Moreover, even the knowledge of its most common co-morbidities, necessary to the development of systems required to manage patients and sustain their families, is also lacking in the continent (Burton, 2015). Contrary from the developed countries, the CP prevalence goes as high as up to 10 per 1000 live births in Africa (Burton, 2015; Donald *et al.,* 2014). A comprehensive literature review by Donald *et al.* (2014) found that, the most common risk factors of CP in African cohorts are birth asphyxia, kernicterus and neonatal infections. This is different from USA and European countries where prematurity or low birth weights are main risk factors (Gladstone, 2010).

Moreover, there are still a lot of research gaps in the area of risk factors for cerebral palsy in developing countries (Ejeliogu, *et al.*, 2017) including Tanzania. This calls for more studies to be undertaken as the better understanding of the aetiology of CP is necessary for developing preventive strategies and treatments (Kulak *et al.,* 2009). Moreover, identifying the risk factors associated with CP covers a way for designing

interventions that help to reduce the incidence of the disease (Ejeliogu, *et al*. 2017).

In the case of Tanzania, studies on the prevalence of CP and medical handling of CP children are limited. These studies include that of Karumuna and Mgone (1990) who conducted a study at Muhimbili Medical Centre in Dar es Salaam between December 1985 and 1986 and found that spastic tetraplegia, spastic diplegia and hemiplegia occupied 36, 20 and 15 percent of the studied children respectively. The authors also found that the causes of CP included birth asphyxia, convulsions of undetermined causes, low birth weight, meningitis and cerebral birth trauma.

Kisanga *et al.* (2012) also conducted their study at orthopaedic clinics and physiotherapy unit at CCBRT Hospital in Dar es Salaam and found that 75% of children studied had spastic form of CP which was caused by perinatal problems. On the other hand, Mwakyusa *et al.* (2009) examined issues related with birth Asphyxia while leaving other risk factors of CP unexplored. It can be seen that the few studies available in Tanzania were concentrated in Dar es Salaam and some have been conducted more than thirty years. Hence there is high need for other studies to be conducted in other zones like southern highlands of Tanzania.

Thus this study was devoted at estimating the prevalence of CP, identifying the risk factors associated with CP in the study area and determining the challenges faced by medical personnel while handling CP cases in children. Information obtained from this study is important for improved health services in the study area and the country at large as it provide guides for giving services to disabled children and effectively target the aetiologies of CP as well as establishing preventive measures of CP.

1.2 Statement of the Research Problem

In spite of CP being a common chronic childhood disorder worldwide, there is still limited information about the CP panorama in sub-Saharan Africa (Burton, 2015; Donald *et al.*, 2015; Kakooza-Mwesige *et al.,* 2015) in particular Tanzania. This creates the need to conduct CP studies on other parts of the country including southern highlands of Tanzania to have information which will aid prevention and for screening purposes. The results emanating from the present study are invaluable in reducing the burden of CP in the study area and also helpful to health workers, planners and policy makers.

1.3 Research Objectives

1.3.1 General Research Objective

To determine the prevalence and risk factors associated with cerebral palsy at Mbeya zonal referral hospital.

1.3.2 Specific Research Objectives

(i) To determine the prevalence of cerebral palsy in the study area

(ii) To identify the risk factors for cerebral palsy in children at the study area.

(iii) To identify the challenges faced by medical personnel while handling cerebral palsy in children at the study area.

1.4 Research Hypotheses

i.   The prevalence of cerebral palsy in children is high in the study area.

ii.   There are many risk factors for cerebral palsy in the study area.

iii.   There are many challenges facing medical personnel in handling cerebral

palsy in children in the study area.

1.5 Significance of the Study

This research contributes to the national strategy for child health and wellbeing. It also informs policy by providing information to health practitioners, policy makers and other stake holders that will provide appropriate measures to improve the health services particularly to CP patients in the study area. Moreover, the outcome of this study motivates further studies in other areas in the country.

1.6 Organization of the Study

This study is organized into six chapters. Chapter one presents the introduction, which focuses mainly on the background, problem statement, objectives and significance of the study. On the other hand, chapter two firstly discusses the theoretical literature review followed by empirical literature review. Chapter three presents the methodology that was used by the current study, chapter four give details of the findings while chapter five dealt with discussions of the findings and lastly chapter six presented conclusions and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual Definition

Cerebral palsy õdescribes a group of permanent disorders of the development of movement and posture, causing activity limitation, that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brainö (Rosenbaum *et al*., 2007). According to these authors, the motor disorders of cerebral palsy are often accompanied by disturbances of sensation, perception, cognition, communication and behaviour, epilepsy and secondary musculoskeletal problems.

2.2 Classification of Cerebral Palsy (CP)

Cerebral palsy has been grouped into different type namely spastic, athetoid, ataxic and mixed types (Ejeliogu *et al*., 2017; Himmelmann and Hagberg, 2007). Children with spastic CP are characterized by unique muscle tightness and muscle spasticity as the main impairment characteristic (Ashwal and Russman, 2004). Spastic is the most common CP worldwide compared to others and is easily manageable than other types since treatment through medication can be done in a variety of neurological and orthopaedic approaches (Alshehri and Bach, 2014). On the other hand, spastic CP can be further sub-classified into spastic hemiplegic, spastic diplegic and spastic quadriplegic types (Kliegman *et al.,* 2007).

According to Ejeliogu *et al*. (2017), infants with spastic hemiplegia are characterized by decreased spontaneous movements on the affected side and reveals hand preference at a very early age. The upper limb is also more involved other than the

lower limb and the infant experience difficulty in hand manipulation at the age of 1 year. In spastic diplegic CP, spasticity is worse on the lower limbs compared to the upper limbs and that a child show legs with brisk reflexes, ankle clonus, and a bilateral Babinski sign (this is used for tone test). Spastic quadriplegic CP on the other hand, is the most severe form of CP because of marked motor impairment of all extremities and the high association with intellectual disability and seizures. Neurologic examination shows increased tone and spasticity in all extremities, decreased spontaneous movements, brisk reflexes, and plantar extensor responses.

It is worth noting however that, the distribution of the clinical subtypes of spastic CP cases varies across countries. For example a study by Goel and Ohja (2015) in India revealed that 52.92% of cases were spastic Diplegic and 27.50% were spastic quadriparesic. A study by Eriman *et al.* (2009) studied 202 children with CP and found that 34% was spastic Diplegic and 32% was spastic quadriplegic. However, the distribution of these clinical subtypes is not known in the study area (to authorøs best knowledge). This calls for studies to be done to document the prevailing spastic subtypes for proper prevention, management and treatment.

Moreover, Athetoid CP is less common compared to spastic CP (Alshehri and Bach, 2014; Ejeliogu *et al*., 2017). Patients with this type of CP are characteristically hypotonic with poor head control and marked head lag and develop increased variable tone with rigidity and dystonia over several years (Ejeliogu *et al*., 2017). Steady sitting and walking becomes quite problematic; individuals may show some unintended motions may lose their ability to hold objects especially small objects that require some fine or advanced motor control (Alshehri and Bach, 2014).

Furthermore, Ataxic CP the least common type, it is usually associated with hypotonia which usually persists into early childhood. Common features include delayed motor development, dysarthria, intention tremor, ataxic stance and gait disorders (Kliegman *et al.,* 2007). A patient may shake while attempting to hold objects with the hand and may have difficulties in their control of motor skills, such as typing, writing and holding small objects (Alshehri and Bach, 2014).

2.3 Perception of the Community on Cerebral Palsy

Perceptions of the community about disability are very important as it influences the way the disabled children are cared (Curran and Runswick-Cole, 2013). However, community's perceptions and treatment of disabled children differs significantly from one context to another (Curran and Runswick-Cole, 2013). In some contexts, disability like CP is perceived as something originating from witchcraft (Braathen *et al.*, 2015). People also believe that a disabled child is a result of witchcraft in such a way that a healthy child is taken out of her mother's womb and get replaced with a disabled one who when is born is not quite a human but looks like a human being (Braathen *et al.*, 2015). However, in some areas people have a belief that all misfortune including diseases has its origin from illness, religion, and magic inseparable (Paget *et al.,* 2016).

Moreover, in many African countries including Tanzania, children with cerebral palsy as well as their families are frequently cast out from society due to stigmatisation, which forces them to encounter many economic, political, and social challenges as they can be denied the basics of education, healthcare, recognition, and socialisation (Donald *et al.,* 2014). In most of regions of Tanzania including Mbeya

region children with cerebral palsy face challenges in form of stigma, isolation and pity from surroundings communities i.e. most who are living in rural and primitive area like masai. This was evidenced from the =The Citizen Newspaper of Tuesday March 8th, (2016)ø which noted that children with cerebral palsy in some societies are kept in dark room all the time with nothing to sit on and was never brought out to be part of the community. They are forced to be there with no stimulation and certainly with no education.

Generally the community have negative perception of people with disability like CP with the exception of medical health officers. However, the negative perceptions can lead to lack of opportunities and work, low self-esteem, and isolation, and consequently to stigmatization, marginalization, and recurring negative health outcomes that prolong the discomfort of people with disability and also create a substantial social burden (Zheng *et al.,* 2016). Stigmatisation of children with cerebral palsy can be manifested by children and even adults who stare or even verbally reject these children when they are in public places, such as shopping centres, parks, or even on the street (Donald *et al.,* 2014).

Hence it becomes difficult for parents to take care of their children in a positive manner while they are in public places because of embarrassment or humiliation that they feel as the outcome of responses from the community (Whittingham *et al.,* 2011). This adverse reaction by the community towards CP children is a great challenge to caregivers (Resch *et al*., 2010). Since others often do not know how to deal with a child with a disability, children as well as their caregivers are often excluded from social events, such as birthday parties or weddings, and such negative

public attitudes can leave them feeling isolated (Bourke-Taylor *et al.*, 2010).

2.4 Management of Cerebral Palsy

The management of patients with cerebral palsy is supposed to be individualized based on the child's clinical presentation and requires a multidisciplinary approach. It requires adequate assessment of the specific impairments causing disability in order to have appropriate interventions (Matthews and Balaban, 2009). A number of management practices for children with CP have been suggested. Amongst these interventions include use of oral medications, botulinum toxin A injections, intrathecal baclofen, physical and occupational therapy, splinting and casting, electrical stimulation, selective dorsal rhizotomy, and orthopedic surgery (Amirsalari *et al.,* 2011; NSW Government, 2018; Shamsoddini and Hollisaz, 2009; Shamsoddini, 2010).

2.4.1 Oral Medication

This involves application of baclofen, diazepam, clonazepam, dantrolene and tizanidine to children with CP (Chung *et al*. 2011). Oral medications is used to reduce spasticity in children with CP. However, majority of them have unwanted side effects such as drowsiness, sedation, confusion and fatigue (Awaad *et al.,* 2015). Benzodiazepines, such as diazepam, are rarely used because of their strong sedating effects (Awaad, *et al.,* 2015). On the other hand, baclofen is a commonly oral medication for CP   patients with generalized dystonia and spasticity   (NSW Government, 2018). Its action on receptors in the spinal cord suppresses muscle spasms and reduces muscle tone. Administered intrathecally, Baclofen can be delivered directly to the site of action, allowing smaller doses and fewer side

effects. However, there is currently weak evidence to support the administration of intrathecal Baclofen to help with the reduction of spasticity and dystonia (NSW Government, 2018).

2.4.2 Chemo-Denervation

Chemo-denervation like Botulinum Toxin A has proved easier, more effective and less painful to CP patients (Awaad et al., 2015). Botulinum Toxin A is a neurotoxin which is injected into targeted muscles to treat localised spasticity and dystonia in children with CP (NSW Government, 2018). When applied, Botulinum Toxin A prevents the release of acetylcholine, one of the main neurotransmitters at the neuromuscular junction and causes muscle paralysis (NSW Government, 2018).

2.4.3 Stretch Intervention

This is one of the commonly used interventions for the treatment of contractures in children with cerebral palsy (NSW Government, 2018). This practise maintains or increases the range of motion of a specific joint. According to NSW Government (2018), stretch intention is utilized in three major forms namely application of orthoses or a specific positioning program, serial casting and manual stretch program. Functional orthoses position joints in a biomechanically advantageous position to either enable or improve function. Examples may include Ankle foot orthoses, wrist extension orthoses, neoprene wrist and thumb orthoses. On the other hand, casting is a therapy intervention applied to enhance/ restore muscle length and provide soft tissue elongation (NSW Government, 2018). Casting is conducted as a one off or as a series of casts depending on the anticipated outcome and the childøs forbearance for casting.

2.4.4 Electrical Stimulation

According to NSW Government (2018), electrical stimulation is grouped into three main forms namely functional electrical stimulation (FES), neuromuscular electrical stimulation (NES) and therapeutic electrical stimulation (TES). FES uses surface electrodes to stimulate muscles or nerves which have impaired motor control with the objective of stimulating functional movement while NES is a high intensity, short duration stimulation using surface electrodes in which a muscle contraction is stimulated.

TES on the other hand is a low intensity stimulation utilized continuously for longer durations. However, FES is the preferred form of electrical stimulation. However, there are other interventions different from those mentioned in the above sections which include selective dorsal rhizotomy which is a neurosurgical spasticity-reducing intervention for children with spastic cerebral palsy, strengthening and resistance training, orthopaedic surgery, alcohol and phenol injection (NSW Government, 2018; Verschuren *et al.,* 2014) to mention a few.

2.5 Cerebral Palsy Prevention

Prevention of CP is mostly based on the type and causes of the respective condition. For example prevention of neurologic disability which is caused by complications of multiple gestations is possible by decreasing the rate of multiple gestations through avoidance of pregnancy in older women prenatal, perinatal and postnatal care prevetion (Nanjundagowda, 2015). Since approximately one-half of majority new cases of CP rise from the group of neonates born prematurely, it is likely that

interventions that either prolong gestation or reduce the risk of preterm delivery will also reduce the risk of cerebral palsy (OøShea, 2011). Ways to decrease the rate of preterm birth, include limiting the number of embryos transferred with vitro fertilization, smoking cessation during pregnancy, screening for and treatment of asymptomatic bacteriuria during pregnancy and antiplatelet drugs to prevent preeclampsia (OøShea, 2011).

On the other hand, calcium channel blockers and an oxytocin antagonist for women with preterm labor and erythromycin for women with premature rupture of the membranes are amongst the interventions that have indicated the ability to prolong pregnancy (OøShea, 2011). Moreover, treatment with glucocorticoids (eg. - methasone) to mothers who are likely to deliver before 36 weeks gestation reduces the risk of cerebral palsy (OøShea, 2011). Furthermore, one of the recognized sources of neonatal encephalopathy is intrapartum cerebral hypoxia and ischemia, which in severe cases could result in permanent brain damage manifesting as cerebral palsy.

In such infants, hypothermia, either selectively applied to the head or total body, appears to decrease the risk of neurodevelopmental impairments, including cerebral palsy (Shankaran, 2005). Even though this intervention seems to be effective, it is applicable to only a small proportion of children who subsequently develop cerebral palsy (OøShea, 2011). Other causes of CP can be prevented by public health measures such as improving the nutritional status, access to basic medical facilities, and good prenatal and perinatal care.

2.6 Theories of Cerebral Palsy

2.6.1 Dynamic Systems Theory (DST)

Dynamic Systems Theory (DST) is a theory of motor development that can be utilized for management of children with Cerebral Palsy (Darrah and Bartlett, 1995). DST suggests that movement is produced from the interaction of multiple sub-systems within the person, task and environment (Thelen, 1989). All of the sub-systems spontaneously self-organize, or come together and interact in a specific way, to produce the most efficient movement solution for each specific task (Thelen, 1989). Moreover, this theory also suggests that no sub-system is most important in this process (Thelen *et al.,* 1987). Thus, in order to assist children with CP to learn a new motor ability, medical personnel have to consider and evaluate all aspects of the task, person and environments.

According to DST, development is a non-linear process (Thelen, 1989). This suggests that movement is not developed in a continuous manner, at a steady rate. Rather, a small, but critical change in one sub-system can cause the whole system to shift, resulting in a new motor behaviour (Smith and Thelen, 1993). This phase shift, or transition period is critical to DST's application to motor development. Thus this study will embrace DST as it can be used as a framework to guide intervention for children with CP in the study area. DST is important in the study of children with CP because CP affects movement and posture, with possible limitations in activity and participation (Rosenbaum *et al*., 2007).

In addition, physiotherapy intervention commonly focuses on the development and achievement of motor abilities, or the child's capacity to perform a movement

(Bartlett and Palisano, 2000). Functional mobility is thought to be an important outcome of physiotherapy intervention for children with CP (Tieman *et al.,* 2007). Moreover, physiotherapy services also aim to promote long-term health and prevent further impairments as the child grows and changes (Bartlett and Palisano, 2000). Hence DST was important in the current study.

2.6.2 Theory of Mind (ToM)

The origin of the term ‚theory of mindø (ToM), can be traced back from an article by Premack and Woodruff (1978). It refers to the capability to ascribe mental states to oneself and to others, i.e. the capability to understand that oneself and other individuals have thoughts, beliefs and emotions, and that these also influence our behaviour in different situations (Tager-Flusberg *et al.,* 1993). On the other hand, because of lack of vocalisations and motor dis-functions, CP patients often experience less spontaneous contacts with the surroundings and their potential for active manipulation of objects is far less than those of their peers (Falkman *et al.* 2004). They have a limited ability for independent pretence play and for interacting and playing with other children (Falkman *et al.* 2004). Their contribution to discourse in conversational situations is also often limited (Hjelmquist and Dahlgren Sandberg, 1996; Falkman *et al*., 2002). These circumstances are all highly relevant from a ToM perspective.

Earlier studies have shown that children with cerebral palsy achieve lower scores on tests of working memory compared to children without disability matched for sex and mental age (Dahlgren, 1996), and at the same time they exhibit difficulties related to communicative skills which require a ToM, such as referential

communication (Dahlgren *et al*., 2004). Together these aspects make studies of children with cerebral palsy especially interesting from a ToM perspective. Hence this study was also guided by ToM.

2.7 Empirical Literature Review

2.7.1 Prevalence of Cerebral Palsy

Prevalence of CP has been studied worldwide. A study by Gladstone (2010) indicates that rates of CP in population-based settings in China and India ranges from 2ό2.8/1000 live births and that hospital-based studies of CP revealed increased rates of spastic quadriplegia rather than diplegia or hemiplegia and possibly increased rates of meningitis, jaundice and asphyxia and lower rates of low birth weight and prematurity in CP populations. Kisanga *et al.* (2012) in Tanzania conducted a retrospective hospital based cross sectional study to determine the prevalence and causes of cerebral palsy among children (under the age of five) attending orthopaedic clinics and physiotherapy unit at CCBRT hospital.

The authors gathered data from registry books and patient files and a total of 232 cases (144 males and 88 females) were included in the study. The study found that male children were mostly affected than females and that most cases of CP were associated with perinatal problems. This seems to be the only recent study of CP in the country. However, the study involved only one hospital in Dar es Salaam, thus its findings may not represent all hospitals in the country. Hence more studies are needed to ascertain the prevalence of CP in the country for proper allocation of resources and setting strategies for prevention, management and treatment.

Another study by Lang *et al.* (2012) also examined the prevalence of CP among the Asians group using a retrospective cohort of 629 542 Asian and 2 109 550 white births in California from 1991 to 2001. The findings show that CP prevalence was lower in Asians than whites (1.09 vs 1.36 per 1000; relative risk = 0.80, 95% confidence interval [CI] = 0.74ó0.87) and ranged from 0.61/1000 in Thai children to 2.08/1000 in Samoan children. However, the study does not tell us as to why prevalence was lower in Asians than whites. Other researchers should find out why there is difference between CP prevalence in Asians groups and whites.

2.7.2 Risk Factors of CP

Studies regarding risk factors of CP have been done globally with more focus on children with CP in the developed countries while ignoring the developing world. For example a study by Ejeliogu *et al.* (2017) in Nigeria recruited 140 children with CP attending the paediatric neurology clinic of Jos University Teaching Hospital as cases and 140 children without CP attending the general pediatric out-patient clinic of the hospital as controls. The authors used structured questionnaires, hospital records, physical and specialized examination to document information about the CP children.

The findings reveal that the risk factors that were significantly associated with cerebral palsy were birth asphyxia, neonatal jaundice and central nervous system infections and Children with history of home delivery, were more likely than controls to develop CP: adjusted odds ratio (AOR)=3.26 (1.68-5.21), p<0.001; AOR=6.78 (3.52-13.37), p<0.001; AOR=1.87 (1.07-3.29), p=0.03 and AOR=2.69 (1.08-7.16), p=0.03 respectively. However, the sample size was relatively low and -

the study has considered only one hospital hence these results may not give the full picture of the risk factors associated with CP in Nigeria.

Kulak *et al.* (2009) also reviewed the medical records of children with CP at department of paediatric neurology and rehabilitation in Białystok hospital, Podlaskie province, Poland. The results indicate that antenatal and intrapartum risk factors associated with increased CP included abruptio placenta, pre-labour rupture of membranes, prematurity, preterm labour, caesarean section and low birth weight (< 2500 gram) whereas the neonatal risk factors were respiratory distress syndrome, prolonged ventilation, septicemia, meningitis, hyperbilirubinemia, neonatal seizures, and severe cranial ultrasound abnormality. On the other hand, the logistic regression models revealed that prematurity and asphyxia are the risk factors associated with CP. Since the study was conducted in only one province and on one hospital, this calls for similar studies to be conducted in other provinces to ascertain the risk factors associated with the increase of CP in children.

Another study by Monokwane *et al. (*2017) from Botswana evaluated the risk factors associated with increased CP in children. The authors used 56 cases and 56 age-matched controls and collected data through care giver interviews, review of medical records and physical examination and used conditional logistic regression models for analysing the data. The findings show that significant risk factors for CP in the study were history of serious neonatal infection like (cerebral malaria, sexual transmited disease and pelvic infection disease) (odds ratio 15.0, p= 0.009), complications during delivery (odds ratio 13.5, p<0.001), and maternal Human Immunodeficiency

Virus (HIV) infection (odds ratio 3.5, p < 0.03). This study however had relatively small sample size, with sufficient power to detect only large odd ratios and hence the results cannot be generalized to represent the African continent and the country of Botswana.

On the other hand, Li *et al*. (2011) studied the risk factors of CP in China. A total of 632 cases of CP and 931 children without CP aged <1~14 years (4.31±2.3 years) were employed as controls. Risk factors investigated including preterm birth, multiple pregnancy and infection during pregnancy and neonatal convulsion. Logistic regression model was used to analyse these risk factors of CP. It was found that the risk factors increasing the prevalence of CP included neonatal convulsion (80.34, 34.75 to 182.64), low Apgar score (19.98, 10.85 to 34.96), low birth weight (5.83, 3.47 to 9.77), Infection during pregnancy (6.24, 5.01 to 12.25) and maternal age of ×35 years (4.69, 2.54 to 5.59). However, this study did not consider the risk factors in term and preterm infants which was taken care in the current study.

Moreover, a study by Tatavarti *et al.* (2015) evaluated the antenatal maternal risk factors associated with CP at Rani Chandramani Devi Hospital in India. The authors collected data from mothers of 100 CP children who got treatment from this government hospital from 2012 to 2014 and from mothers of 100 normal children. Logistic regression analysis was applied for data analysis. It was found that the association of maternal anaemia, maternal hypertension, pre-eclampsia, eclampsia, antepartum haemorrhage and multiple pregnancy with CP was 7.3, 6.6, 6, 8.6, 8.6 times higher than with control respectively.

2.7.3 Challenges Facing Medical Personnel in Handling Cerebral Palsy Children

Owing to its complexity and treatment requirement, management of CP presents a number of challenges (Alshehri & Batch, 2014). According to these authors, the challenges begin from diagnosis to the provision of care long after diagnosis. Hence a comprehensive management program should begin after diagnosis (Krigger, 2006). Using secondary data, Alshehri & Batch (2014) identified treatment, patient care and support, clinical processes, and patient quality of life as the challenges to CP management. However, researches on challenges faced by medical personnel while handling CP patients are limited.

The focus has been on challenges faced by mothers, guardians, caregivers, teachers on handling children with CP (Chinombwe, 2007; Raina *et al*. 2005; Singogo *et al*. 2015). However, determining the challenges of CP management to medical practitioners is as important as to other groups of caregivers since it enable such professionals to understand the issues and needs that they need to monitor in the successful management of CP (Dana and Ann, 2009). Thus this study determined the challenges faced by medical personnel at Mbeya zonal referral hospital while handling CP cases.

2.8 Research Gap

Majority of CP studies have been done in Europe, North America and Australia, either through registers of child impairments or large population-based studies (Gladstone, 2010) hence there is a need to do research in African setting because prevalence and risk factors of CP varies across countries. Still there is yet limited

information about the CP (that is risk factors, prevalence and challenges facing medical personnel during handling the CP) panorama in sub-Saharan Africa (Burton, 2015; Donald *et al.*, 2015; Kakooza-Mwesige *et al.,* 2015) in particular Tanzania.

Moreover, the few existing studies in Tanzania (Karumuna and Mgone, 1990; Kisanga *et al.*, 2012; Mkwabe and Mgone, 1984; Mwakyusa *et al.*, 2009) have focused on CP patients available in Dar es Salaam leaving other areas such as Southern highlands unresearched. This creates a research gap that need to be filled so as to generate information to be used by the government, policy makers, donors and other stakeholders for prevention, treatment and proper allocation of scarce resources. In addition, absence of information on prevalence, risk factors associated with CP and the challenges encountered while serving CP patients may lead to less attention on the disease by the government and other stakeholders and hence its increase. Hence there was a need to conduct this study to provide information to different stakeholders on the incidence, risk factors associated with CP and the challenges facing medical personnel while dealing with CP cases.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

This chapter presents the methods that were used to conduct the study. This includes research design and its rationale for selecting survey design, population of the study, sampling techniques, data collection instruments such as questionnaires, interviews as well as observations (Bryman, 2008). It also presents the sampling methods, data analysis techniques utilized, ethical issues, validity and reliability of the study.

3.2 Research Philosophy

Research philosophy is a system of beliefs and assumptions about knowledge development (Saunders *et al.,* 2012). The positivism research philosophy was applied by this study. Saunders *et al.* (2012) pointed that philosophy is used for studies which utilize highly structured methods and quantitative data gathering techniques such as the current study.

3.3 Research Approach

A deductive approach was utilized as the current study started with theoretical understanding of CP, the risk factors of CP and the medical handling of CP. The approach was selected because of its features which fitted well with this study. With deductive approach, it was possible to use structured methods which provides a possibility of replicating the study (Gill & Johnson, 2010).

3.4 Research Design

A descriptive quantitative research design in a cross-sectional survey was applied.

The design was selected as it is suited for researches applying deductive approach as was with this study. The survey strategy enables a researcher to gather data economically from large populations (Saunders *et al.,* 2012).

3.5 Study Area

The study was conducted at Mbeya Zonal referral Hospital. The selection of Mbeya zonal referral hospital was based on the fact that it has more experienced medical specialists and personnel and that it receives CP patients from districts and regional referral hospitals in the zone. Thus the study expected to record a variety of CP patients attending at the hospital. Moreover, this place has been selected because of its simplicity to reach and to collect data at time.

3.6 Survey Population

The study population included 1000 workers at Mbeya zonal referral hospital. The sampling frame included 200 workers (doctors and nurses) of Mbeya zonal referral hospital who are dealing with handling CP patients at the hospital.

3.7 Sampling Design and Procedures

Simple random sampling (SRS) was used to get respondents for the study. In this method each member of the study population had equal chance of been chosen as part of the sample. Simple random sampling (SRS) eliminates bias from the selection procedures and results into representative samples (Gravetter & Forzano, 2011). In the current study, the researcher obtained a list of doctors and nurses who are dealing with CP from Mbeya zonal referral hospital. Then from the list, the sampling units (Doctors and nurses) were chosen without replacement in the sense

that the units once chosen are not placed back in the sampling frame. Thereafter the chosen individuals were given questionnaires for the study.

3.7.1 Sample Size

Sample size is referred to as the number of observations in a sample (Evans *et al.,* 2000). The sample was calculated using a formula:

$n = N/1+N (e)^2$ where n = sample size, N = survey population and e=level of precision.

Thus, $n = N/1+N (e)^2 = 200/1+200(0.05 \times 0.05) = 133$

However, when we minus 10% of the total calculated sample size, the remaining will be 120 respondents. Thus the study used a sample size of 120.

3.8 Methods of Data Collection

The study employed both primary and secondary data to accomplish the intended objectives under the study.

3.8.1 Primary Data Collection

Given the nature of medical workers, primary data were collected using self-administered questionnaires, observation and interview. The data collected included risk factors for CP and challenges facing medical personnel in handling CP children as described below.

3.8.1.1 Risk Factors of CP

Selfóadministered questionnaire was used to collect information about the risk factors from respondents. Medical personnel were asked to explain medical

condition commonly associated with CP during prenatal, perinatal and postnatal delivery periods.

3.8.1.2 Challenges Facing Medical Personnel during Handling CP Children

Responses about the challenges facing medical personnel when handling CP patients at Mbeya Zonal referral Hospital was obtained through self-administered questionnaire. The information collected was based on the availability of medical facilities that are used to treat patients with CP, space for treating children with CP, number of expert for treating patients with cerebral palsy, workshops on provision of knowledge to expert on how to treat, manage and prevent concurrent of CP as well as availability of fund to manage the issue mentioned.

3.8.2 Secondary Data Collection

3.8.2.1 Prevalence Data Collection

In this study secondary data was collected at Mbeya zonal referral hospital. The data for CP was collected through registry account book of children born from 2006 ó 2017. The registry book contained information of the name of the patient, age, sex, history from mother, treatment and remarks. The data collected were detailed medical history: present illness, present history of pregnancy and delivered, also perinatal history, past medical history and developmental history of the neonatal born. In addition data on the risk factors and prevalence of CP in the study area was obtained from Hospital records from 2006 - 2017.

3.9 Variables And Measurements for Model Analysis of Risk Factors

The logistic regression model was used to analyses risk factors that led to CP

prevalence at Mbeya Zonal Referral Hospital. Three logistic regression models were used. The first model dealt with prenatal factors (intrauterine infection, malformation of cortical development and premature delivery) while the second model assessed the perinatal factors (Antepartum hemorrhage, amnionitis, neonatal meningitis, neonatal seizures, and birth asphyxia. The third model evaluated the postnatal risk factors (Traumatic brain injury, hemorrhagic stroke, ischemic stroke, central nervous system infection). This study consisted of all cases of moderate, severe CP recorded at Mbeya Zonal Referral Hospital in 2006-2017.Variables collected were age ,gender, information on antepartum hemorrhage ,amniotic ,neonatal seizure ,birth asphyxia, traumatic brain injury, hemorrhagic stroke, ischemic stroke, central nervous system infections, intrauterine infection such as STDøs, HIV and E-coli, malformation of cortical development and premature delivery.

3.10 Data Processing and Analysis

The data were visually inspected to check for incompleteness, data entry errors and missing data before analyses were conducted. It was found that one case contained a missing value. The researcher used mean substitution to handle the missing data as recommended by (Tabachnick & Fidel, 2013).

3.10.1 Data Analysis

Statistical Package IBM-SPSS (version 20) was utilized for data analysis. Descriptive statistics were generated for most of the variables and logistic regression were performed to evaluate relationships between selected variables and prevalence of CP as described below.

3.10.1.1 Descriptive Statistics

Descriptive statistics were used to summarize the demographic profile of respondents. Additionally, descriptive statistics were calculated to indicate the prevalence of CP at Mbeya zonal referral hospital over the years. Moreover, descriptive analysis was done for the challenges that medical personnel faced while dealing with CP cases at the study area.

3.10.1.2 Logistic Regression Analysis

Logistic regression was used in this study to predict prevalence of CP, a categorical and binary (dichotomous) variable, from a set of predictor variables that are referred to as risk factors. The logistic regression helps to model the determinants of and predict the likelihood of an outcome, in this case prevalence of CP. Thereafter, the Hosmer-Lemeshow was used to test the null hypothesis that predictions made by the Logistic regression model fit perfectly with observed values. The Hosmer-Lemeshow test generates a chi-square statistic that compare the observed frequencies with those expected under the linear model. In this test, a non-significant chi-square indicates that the data fit the model well (Hosmer & Lemeshow, 1980).

Three logistic regression models were analysed in this study. Where CP = cerebral palsy, = the intercept, $_1$í í .. $_5$ are coefficients of the respective risk factors.

The first model evaluated three prenatal factors: (i) intrauterine infection, (ii) malformation of cortical development and (iii) premature delivery.

CP = + $_1$intrauterine infection + $_2$malformation of cortical development + $_3$ premature delivery..í í í ....(1)

The second model included five perinatal factors: (i) Antepartum haemorrhage, (ii) amnionitis, (iii) neonatal meningitis, (iv) neonatal seizures and (v) birth asphyxia.

$CP = + _1$Antepartum haemorrhage $+ _2$amnionitis $+ _3$Neonatal meningitis $+$

$_4$Neonatal seizures $+ _5$birth asphyxia í í í í í í í í í í í í í í í .. (2)

The third model included four postnatal risk factors: (i) Traumatic brain injury, (ii) haemorrhagic stroke, (iii) ischaemic stroke, and (iv) central nervous system infection.

$CP = + _1$Traumatic brain injury$+ _2$Haemorrhagic stroke $+ _3$Ischaemic stroke $+$

$_4$Central nervous system infection í í í í ..í í í í í í í í í í í í .... (3)

CHAPTER FOUR

RESEARCH FINDINGS

4.1 Overview

This chapter presents the findings of the current study. It reveals what respondents perceived the questions asked about cerebral palsy as well as the respondentøs demographic factors.

4.2 Respondent's Age by Sex

Table 4.1 indicates the results on respondentøs age by sex. It reveals that 49 participants equivalent to 40.8% aged between 20 ó 30 years. In this age group males were 32 equivalents to 65% while females were 17 (35%). Table 4.1 also indicates that 42 respondents had their age between 31- 40 which is 35% of all respondents. However, only 9 respondents (7.5%) had age above 50 years. 4.3.

Table 4.1: Respondents' Age by Sex

Age	Male	Female	Frequency	Percent
20 - 30 years	32	17	49	40.8
31 - 40 years	21	21	42	35.0
41 - 50 years	2	18	20	16.7
51 or above	5	4	9	7.5
Total	**60**	**60**	**120**	**100.0**

Source: researcher, 2018

4.3 Respondents Distribution by Marital Status

Table 4.2 reveals the distribution of respondents according to their marital status. It shows that majority (50.8%) of research participants were single followed by a group of married participants which occupied 36.7%. On the other hand, 7.5% of respondents were separated and the least percent was occupied by widowed respondents.

Table 4.2: Respondent's Marital Status

Marital status	Frequency	Percent
Married	44	36.7
Single	61	50.8
Widowed	6	5.0
Separated	9	7.5
Total	**120**	**100.0**

Source: researcher, 2018

4.4 Respondent's Distribution by Level of Education

Table 4.3 indicate the results about level of education for respondents. It reveals that 47 respondents equivalent to 39.2% had diploma level of education followed by 39 respondents equivalent to 32.5% of respondents with certificate education. On the other hand, only 9 respondents (7.5%) had postgraduate education.

Table 4.3: Respondent's Distribution by Level of Education

Education level	Frequency	Percent
Certificate[1]	39	32.5
Diploma	47	39.2
Bachelor degree	25	20.8
Postgraduate	9	7.5
Total	**120**	**100**

Source: researcher, 2018

4.5. Prevalence of Cerebral palsy in the Study Area

Table 4.4 reveals the year, live birth and children with CP at the studied area. It shows that on average there are 994.17 live births per year with a CP incidence of 17.7 per year. In other words, the prevalence of CP per 1000 live births is 17.8 in the study area. On the other hand, Table 4.5 shows the relative distribution of CP patients by mothersø district of residence. It reveals that in the year 2014-2015 there were relatively large number of CP incidence compared to other years which

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[1] These are medical personnel who went to school long time ago and they have worked with the hospital for long time and hence they have experience in giving service to patients attending the hospital. They have also attended some trainings to handle patient cases.

amounted to 23 patients followed by the year 2006-2007 and 2016-2017 both with 19 CP patients. The reasons behind this rate include awareness/health education particularly on CP which has taken place in the zonal.

The community is now aware that CP is a disease like other diseases which can be treated at the hospital and not witchcraft or a cause as previously was known like multiple man in relative were either volunteered a sex into results to get CP. This awareness have lead mothers and care givers to send their children to the hospital in particular Mbeya zonal referral hospital. Table 4.5 also reveals that live births was higher in 2014-2015 compared to other years which amounted to 2009. However, in the following year (2016-2017) the live births decreased into 845. The reason increases of awareness about CP at many places compare to the previous period.

Table 4.4: Prevalence of Cerebral Palsy

Year	Live birth(Number)	Frequency	Percentage (%)
2006 ó 2007	302	19	6.3
2008 ó 2009	1002	17	1.7
2010 ó 2011	789	13	1.6
2012 ó 2013	1018	15	1.5
2014 ó 2015	2009	23	1.1
2016 ó 2017	845	19	2.2
Total	5965	106	14.4
Average Per Year	**994.17**	**17.67**	**2.4**

Source: researcher, 2018

4.5. 1. Spatial and Temporal Distribution of Prevalence in CP Children

Prevalence data in CP patients was further analyzed according to district of residence (spatial variation) and among years (temporal variation) (Table 4.5). Highest prevalence was recorded in the year 2014-2015 at Rungwe district at (22.2%) and lowest in Mbarali district at (5.9%). The probable reason for high increase in

prevalence at Rungwe district may predict inadequate experts, low health facilities and lack of awareness which lead to late diagnosis of the disease. Mbarali district on the other hand, may have created high awareness on the importance of mothers attending to clinics regularly and had health facilities which enable to get early diagnosis of CP. Prevalence showed significant spatial variation. In addition, prevalence showed variation among the years as was recorded highest in 2006-2007 at (6.3%) and lowest in 2014-2015 at (1.1%). Temporal prevalence showed significant variation 2006-2007 P=19(6.3%) 2014 -2015 P= 23(1.1%).

Table 4.5: Relative Prevalence of CP Patients by District of Residence

Year	Districts					Total Live Birth	Total CP Patients	Percenta ge
	D1	D2	D3	D4	D5	(Number)	(Number)	(%)
2006 ó 2007	2 (11.1%)	4(21.1%)	3(17.6%)	5(18.5%)	5(20%)	302	19	6.3
2008 ó 2009	3 (16.7%)	3(15.9%)	3(17.6%)	3(11.1%)	6(24%)	1002	17	1.7
2010 ó 2011	2(11.1%)	3(5.9%)	1(5.9%)	3(11.1%)	4(16%)	789	13	1.6
2012 ó 2013	3(16.7%)	2(10.5%)	4(23.5%)	4(14.8%)	2(8%)	1018	15	1.5
2014 ó 2015	5(27.8%)	3(15.8%)	3(17.6%)	6(22.2%)	3(12%)	2009	23	1.1
2016 ó 2017	3(16.7%)	4(21.1%)	3(17.6%)	6(22.2%)	5(20%)	845	19	2.2
Total	**18**	**19**	**17**	**27**	**25**	**5965**	**106**	**14.4**
Average/ year	**3**	**3.2**	**2.8**	**4.5**	**4.2**	**994.17**	**17.67**	**2.4**

D1= Mbeya, D2 = Chunya, D3 = Mbarali, D4 = Rungwe, D5 = Kyela

4.6 Risk Factors Associated With Cerebral Palsy in Children at Mbeya Zonal Referral Hospital

Three logistic regression models were used for determination of the risk factors associated with cerebral palsy. The results are as shown in the following sections.

4.6.1 Logistic Regression Analysis Model

Logistic regression analysis was followed by a Hosmer and Lemeshow test. The later test generates a Chi-square statistics where a non-significant chi-square indicates that the data fit the model well (Hosmer and Lemeshow, 1980). Three different regression analysis models were analysed and the data is presented here below:

4.6.1.1 First Regression Analysis Model

The first model included three prenatal factors namely intrauterine infection, malformation of cortical development and premature delivery. A Hosmer and Lemeshow test indicated a non-significant p-value (Table 4.6). This suggests the data fitted the model well. On the other hand, Table 4.8 indicates that the odd of CP occurring among children with intrauterine infection was about two times more than would occur for those without intrauterine infection (OR = 1.265). However, these results were not statistically significant (p × 0.664). Table 4.8 also shows that the odds of CP not occurring among children with malformation of cortical development was lower by a factor of 0.457. In other words, the probability of CP occurring increased by 0.457 for children with malformation of cortical development. On the other hand, the odds of CP not occurring for premature delivery births was lower by a factor of 0.629 (Table 4.7).

Table 4.6: First Regression Model: Risk Variables in the Equation for the Prenatal Factors

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	IntraI	.235	.541	.189	1	.664	1.265	.438	3.652
	Maltcort	-.783	.524	2.236	1	.135	.457	.164	1.276
	Predel	-.464	.537	.746	1	.388	.629	.219	1.802
	Constant	1.633	.625	6.822	1	.009	5.117		

a. Variable(s) entered for the first regression model: IntraI = Intrauterine infection, Maltcort = Malformation of cortical development, Predel = premature delivery

4.6.1.2 Second Logistic Regression Analysis Model

The second logistic regression comprised of five perinatal factors namely antepartum haemorrhage, amnionitis, neonatal meningitis, neonatal seizures and birth asphyxia. Table 4.8 reveals that Hosmer and Lemeshow p-value was non-significant. This suggests the data fitted the model well. On the other hand, Table 4.9 reveals that the odd of CP occurring among children with amnionitis condition was about one times more than would occur for those without amnionitis (OR = 1.055). Moreover, Table 4.9 also indicates that, the odds of CP not occurring among children with neonatal meningitis was lower by a factor of 0.682. The results from Table 4.10 also show that there was significant association between neonatal seizures and CP occurrence at Mbeya zonal referral hospital. It was also found that, the odds of CP not occurring among children with birth asphyxia was lower by a factor of 0.450.

Table 4.7: Second Regression Model: Risk Variables in the Equation for the Perinatal Factors

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
	Anteha	-1.642	.576	8.118	1	.004	.194	.063	.599
	Amnionitis	.053	.492	.012	1	.914	1.055	.402	2.765
Step 1 [a]	Neomen	-.383	.531	.521	1	.470	.682	.241	1.930
	Neoseiz	-1.844	.664	7.719	1	.005	.158	.043	.581
	Basphyxia	-.799	.623	1.646	1	.199	.450	.133	1.524
	Constant	4.510	1.042	18.720	1	.000	90.921		

a. Variable(s) entered for the second regression model: Anteha = Antepartum haemorrhage; Amnionitis = amnionitis; Neomen = neonatal meningitis; Neoseiz = neonatal seizures and Basphyxia = birth asphyxia).

4.6.1.3 Third Logistic Regression Analysis Model

Table 4.10 reveals that Hosmer and Lemeshow p-value was non-significant. This suggests the data fitted the model. On the other hand, Table 4.11 reveals that the odds of CP not occurring for children with traumatic brain injury was lower by a factor of

0.588. It also indicates that odd of CP occurring among children with haemorrhagic stroke condition was about one times more than would occur for those without haemorrhagic stroke condition (OR = 1.170). Moreover, Table 4.11 shows that the odd of CP not occurring for children with ischaemic stroke was lower by a factor of 0.587 whereas those with central nervous system infection was lower by a factor of 0.944. This suggests that children with central nervous system infection were more likely to develop CP than those with ischaemic stroke condition.

Table 4.8: Third Regression Model: Risk Variables In The Equation for the Postnatal Factors

		B	S.E.	Wald	Df	Sig.	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Step 1[a]	Tbinjury	-.532	.665	.638	1	.424	.588	.159	2.165
	Hastroke	.157	.462	.115	1	.735	1.170	.473	2.893
	Istroke	-.533	.550	.940	1	.332	.587	.200	1.723
	CNSinf	-.057	.464	.015	1	.902	.944	.380	2.344
	Constant	1.704	.664	6.588	1	.010	5.499		

a. Variable(s) entered for the third regression model: Tbinjury = traumatic brain injury; Hastroke = haemorrhagic stroke; Istroke = ischaemic stroke; CNSinf = central nervous system infection.

4.7 Challenges Facing Medical Personnel When Handling Cerebral Palsy Patients

The third objective of this study was to determine the major challenges which face medical personnel in attending and handling cerebral palsy children. The respondents mentioned a number of challenges including few experts, inadequate facilities, low income of parents and other care givers, poor nutrition given to cerebral palsy patients and lack of education for parents and other people taking care of these patients (Table 4.12). The study revealed that 96 respondents identified few

experts as the major challenge facing medical personnel at the hospital followed by

inadequate supply of facilities and poor nutrition among the cerebral palsy patients

(Table 4.12).

Table 4.9: Challenges Facing Medical Personnel When Handling Cerebral Palsy Patients (N =120)

Type of Challenge	Response category			
	YES (Number)	(%)	NO (Number)	(%)
Few experts	96	80	24	20
Inadequate facilities	94	78.3	26	21.7
Low income of parents	90	75	30	25
Lack of education of parents	82	68.3	38	31.7
Poor nutrition of parents	94	78.3	26	21.7

Source: researcher, 2018

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.1 Demographic Profile

Results of the present study indicated that majority of health workers age ranged between 31- 40 indicating a strong sustainable work force capable of handling cerebral palsy in children. Physiotherapist helps patients with physical difficulties resulting from illness, injury, disability or ageing to improve their movement, Vykuntaraju (2015). Female workers dominated the work force (67%) there is an argument that women are more experienced in delivery, hence expected to perform safe deliveries with less CP case (Madinah, 2016).

The findings of the study also indicate that the majority of health personnel had Diploma level of education. Educational level of the health personnel is important as the workers formulate and review treatment programmes using manual therapy (such as massage), therapeutic exercise and electrotherapy, Gunay, et al., (2018).   These results will be discussed more in section 5.4 dealing Challenges facing medical personnel while handling CP patients.

5.2   Prevalence of Cerebral Palsy in the Study Area

The current study establishes that the prevalence of CP is 17.77 per 1000 live births. Paget *et al*. (2016) from Malawi also report childhood disability rates of 17 per 1000 with neurodisability including CP affecting a large number of children. Similarly, Stavsky *et al.* (2017) report a high CP rate in the Australian CP register particularly in multiples and extremely low birth weight neonates (birth weight <1,000 g) which were 7 per 1,000 live births and 50 per 1,000 live births respectively.

On the other hand, Burton, (2015) and Donald *et al.,* (2014) reveal that CP prevalence goes as high as up to 10 per 1000 live births in Africa. The CP prevalence rate high at the study area. The reasons due to the fact that Mbeya zonal referral hospital receives CP patients from different hospitals in the zone i.e. from district and regional hospitals where there are few experts and facilities hence the number of CP patients at Mbeya zonal referral hospital include other hospitals in the zone. On the other hand, this suggest that community awareness about CP patients has increased; previously people in Africa believed that having CP patient at home is a curse and tried to hide them at their homes (Muderedzi *et al.*, 2017).

Among the reasons stated for this curse is that the mother is been punished for her wrong doing and the child is living as a proof of her error (Curran and Runswick-Cole, 2013; Gona *et al.,* 2011). However, of recent the ongoing campaigns on CP have increased awareness on CP. Hence there is increased number of mothers sending their children to the hospitals early just after seen any abnormality to their children. Other reasons include inadequate facilities which helps early diagnosis of CP by medical personnel (reported as one of the challenges facing medical personnel at Mbeya zonal referral hospital), delayed diagnosis of the disease that makes the child to end up with disability and lack of education to pregnant mothers. It was reported that pregnant mothers use herbs during first trimester something which may result into CP development as they may disturb brain development of the foetal.

Unlike the developing world, the CP prevalence in the developed countries is relatively low. For example it is 2.9 per 1000 live births in USA (Maenner *et a.l.,* 2016) 2.30 per 1000 live births in Canada (Oskoui *et al.*, 2013) and 2-3 per 1000

live births in UK (Wimalasundera and Stevenson, 2016). Another study by Germany *et al*. (2013) evaluated the prevalence of post-neonatal cerebral cases using the surveillance of CP in Europe collaboration (19 population-based registries) birth years from 1976 - 1998, the authors found that the mean prevalence rate was 1.20 per 10,000 live births.

Unlike the current study, a recent study in Uganda by Kakooza-Mwesige *et al.* (2017) used a population case based study and found that the crude prevalence of CP was 2·7 per 1000 children and raised to 2·9 per 1000 children after adjustment for attrition. Tseng *et al.* (2018) in Taiwan, China also report low CP prevalence. The authors found that from 2002 to 2008, the annual prevalence of total and severe CP ranged from 1.9 to 2.8 and from 1.1 to 1.4 per 1000 children, respectively and that the CP prevalence was higher in rural population compared to the urban or suburban population. The boys were more likely to develop CP by 30% than their counter parts the girls.

It is worth noting that the prevalence of CP varies across the globe with the developed economies recording low rates whereas the developing economies rates are high including Tanzania. The decrease in the general prevalence and the most severe cases in developed countries may be partly due to public health actions targeted to avert such events and improved healthcare services something which is missing in most African countries including Tanzania. Hence the government and health care practitioners and other stakeholders should take action to prevent CP as - it increase the burden to the parents and the community at large.

5.3 Risk Factors Associated With Cerebral Palsy

One of the objectives of this study was to determine the risks associated with CP in the study area. The findings revealed that the odd of CP occurring among children with intrauterine infection (e.g. STD i.e. gonorhea, syphilis was about two times more than would occur for those without intrauterine infection (OR = 1.265). The results were however non-significant. Similarly, Adogu *et al.* (2016) studied the risk factors associated with cerebral palsy in tertiary health facility in Nigeria and found that intrauterine infection (e.g. toxoplasmosis, Herpes virus and Syphilis) was not associated with cerebral palsy in the study area. Unlike the current study, Miller *et al.* (2013) evaluated the association between maternal infections during pregnancy and CP in Denmark. The results of their study indicates that genito-urinary tract infections and antibiotic usage during pregnancy were linked to increased risks of CP, signifying that some maternal infections which occurs in prenatal life may be part of a causal pathway leading to CP.

The results also indicate that the odds of CP not occurring among children with malformation cortical development was lower by a factor of 0.457 while those of premature delivery children was lower by a factor of 0.629. This implies that, premature delivered children were more likely to develop CP than those with malformation cortical development at Mbeya zonal referral hospital. A study by Kulak *et al.* (2009) in Podlaskie Province where also examined the risk factors associated with CP.

The authors found that prematurity were amongst the factors associated with the occurrence of CP in children. On the other hand, the results also reveal that odd of

CP occurring among children with amnionitis condition was about one times more than would occur for those without amnionitis (OR = 1.055). Similar findings were also found by Bear and Yvonne (2016) in their study of maternal infections during pregnancy and cerebral Palsy in California, USA. The study revealed that extra-amniotic infection was associated with CP. A recent meta-analysis and systematic review of Chorioamnionitis in the development of CP by Shi *et al.* (2017) also reveals that there was significant increase of CP for preterm histologic chorioamnionitis (risk ratio [RR] = 1.34, $P < .01$), but not in clinical chorioamnionitis. Moreover, the findings show that there was significant association between neonatal seizures and CP occurrence at Mbeya zonal referral hospital.

Similar findings was obtained also by the study of Soleimani and Sourtiji (2009) which investigated the perinatal and neonatal risk factors of children with cerebral palsy referred from healthó care centers in north and east of Tehran. The results from this study revealed that neonatal and postnatal seizures were amongst the risk factors associated with CP in the eastern and northern part of Tehran. Kanan (2013) also conducted a study in Bangladesh for children with CP those attended at the pediatric unit of center for the rehabilitation of the paralyzed and found that birth asphyxia and seizure after birth are associated with risk factors for CP in the study area. Co *et al.* 2013 also evaluated the risk factors associated with CP at the neurology clinic of federal medical center in Asaba, Nigeria and found that seizure disorder was amongst the commonest comorbid condition in the study area.

Furthermore, the current study has found that, the odds of CP not occurring among children with birth asphyxia was lower by a factor of 0.450. However, the results

were not significant. This is contrary to the study by Ejeliogu *et al.* (2017) in Nigeria which evaluated the occurrence of risk factors associated with CP in children at Jos University Teaching Hospital. In their study, the authors found that birth asphyxia was significantly associated with CP at the hospital. As above discussion noted, CP care are differs from other country that because the climate economically are differ, from developed to the developing country. Developed country are more advance compere to the developing country.

Nevertheless, the findings indicate that the odd of CP not occurring for children with ischaemic stroke was lower by a factor of 0.587 whereas those with central nervous system infection was lower by a factor of 0.944. This suggests that children with central nervous system infection were more likely to develop CP than those with ischaemic stroke condition. However the results were not significant. These findings deviate from the results of Ejeliogu *et al.* (2017) at Jos University Hospital in Nigeria who found significant association between central nervous system infections with CP. This was according to classification or type of CP normaly present which can obviously indicate the source /or origination of the course e.g., spaciticity.it originating to the central nerve system.

5.4 Challenges Facing Medical Personnel While Handling CP Patients

One step for improvement of the health sector is to identify the existing challenges and put strategies to reduce and eventually eliminating them. The current study identified a number of challenges facing medical personnel which need to be addressed. The challenge that have been mentioned by majority of respondents (80%) was limited number of staff for taking care of CP patients attending the

hospital, inadequate supply of facilities and poor nutrition to CP patients (78.3%), low income among the parents indicates that parents who was coming from rural or primitive area. and care givers (75%) as well as they are lack of education (68.3%) which include inadequate skills and trainings on handling cerebral palsy children by parents and other care givers.

On the other hand, low income among the parents and care givers prevent them from attending the clinic regularly, buying supporting equipment for CP patients and giving balanced diet to their children. Taking unbalanced diet for the CP patients even complicates the matter as it results into malnutrition. i.e in the level of people who are not from ubern area usually they was presenting malnutrition age of 1 year to 5 years. Similarly, Kulwijira (2015) investigated the challenges facing private health service providers in Tabora and came up with a number of challenges including unavailability of qualified staff, poor storage facilities, lack of required drugs and poor government support among others. Another study in Kongwa by Frumence *et al.* (2013) also examined the challenges for implementing the health sector decentralization in Tanzania and found insufficient and unqualified personnel was among the challenges facing the hospital. Other challenges included insufficient funding and untimely disbursement and political interference i.e. enconomicaly interference affecting parents therefore they didnøt manage to bring the CP children in the clinic reguraly.

The Tanzania national health sector strategic plan III also underscores the challenges facing the health sector in the country. In the report, shortage of qualified healthcare

professionals at all levels of the health system, epidemics such as HIV/AIDS, tuberculosis (TB), and malaria, limited access to health facilities and to health professionals due to poor infrastructure, inefficiencies of the healthcare system, poverty and ignorance somehow in few people has been identified as one of the challenges that need to be addressed for smooth running of the sector (URT, 2013).

The challenges of the health sector are almost the same in African countries. For example a study by Madinah (2016) in Uganda examined the challenges and barriers to the health delivery system and found shortage of qualified health workforce and unequal distribution of health worker, lowest investment in maintenance of hospital equipment and facilities as amongst the challenges facing the sector. In the case of Rwanda, a study by Leuchowius (2014) reveals that there is a limited number of doctors and nurses and that medical personnel does not have sufficient knowledge of using and maintaining advanced medical equipment such as MRI scans.

The study also found great lack of advanced technical equipment for example there was only one Magnetic Resonance Imaging (MRI) machine in the country (at King Faisal hospital) and a limited number of X-ray machines. In Kenya on the other hand, the sector is characterized by capacity gaps, human resource deficiency, lack of critical legal and institutional infrastructure and rampant corruption (Kimath, 2017). Moreover, a study by Yunusa *et al.* (2014) in Nigeria also found that poor funding by government, expensive services, insufficient implementation of health care financing policy and corruption were the major challenges of health care financing.

It is worth mentioning that, the net effects of the perceived challenges in Tanzania and African countries at large results into stagnation of healthcare and even a reversal of some gains according to health indicators. Thus there is a need to address these challenges in order to ensure sustainable and improved healthcare services to the Tanzanians.

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Conclusions

The current study concludes that the prevalence of CP at Mbeya zonal referral hospital is 17.77 per 1000 live births. These findings call for actions particularly from the ministry of health and social welfare and other healthcare stakeholders to reduce the incidence of CP in the study area and other parts of the country. It is also concluded from this study that the risk factors which significantly associated with CP in the study was neonatal seizures. However, children with intrauterine infection (OR=1.265), premature delivery (OR = 0.629), amnionitis (OR = 1.055), neonatal meningitis (OR= 0.682), haemorrhagic stroke (OR =1.170) and central nervous system infection (OR = 0.944) were more likely to develop CP than their counterpart without these conditions. It is worth noting that these risk factors can be prevented by basic healthcare improvements particularly the maternal and new-born care which in turn would reduce the occurrence of CP in the study area.

Moreover, it is concluded that, the challenges facing the medical personnel at Mbeya zonal referral hospital include few experts, inadequate supply of medical facilities, low income to parents and care givers which hinder them from providing necessary requirements to CP patients, lack of education and poor nutrition. These challenges need to be addressed to reduce the CP prevalence and provide conducive environment for its management by medical personnel.

6.3 Recommendations

This study has come up with a number of recommendations which are directed to the

government as well as the Tanzanian community at large. Follows are the recommendations of this study to the government of Tanzania:

The study also recommends to the government that pregnant women, their husbands and other family members should be educated on danger signs in new-borns and infants so as to take precautions. The government now a day they trying to their level best to involve the husband to escort the wives in clinic in order to get knowledge how to care the antenatal to the birth. Also they have also a leave maternity The study also recommend establishing a well-equipped neonatal intensive care and intensive physiotherapy units at all zonal hospitals including Mbeya zonal referral hospital as well as increasing the number of experts to adequately handle CP patients in the zone. This may be achieved either by employing new staff or training the available staff on how to handle CP patients.

It is recommended further that pregnant women should attend antenatal care regularly. This will help to underscore symptoms that need early attention . It is also recommended that all women should deliver at the hospitals and that medical personnel and the community at large should actively discourage home delivery. Pregnant women and sucking mothers should immediately find help at the close clinic when they notice any problem including yellowness of the eyes to children, fever and poor sucking. The study also recommend that parents particularly fathers should actively get involved in taking care of children and attending different healthcare training to be equipped with knowledge on handling CP patients rather leaving this task to mothers only.

6.4 Areas for Future Research

This study has examined the prevalence of CP, risk factors associated with CP and challenges facing medical personnel while handling CP patients at Mbeya zonal referral hospital. Future studies may decide to replicate this study in other zonal referral hospitals like Bugando to ascertain the rates of CP and risk factors associated with the disease as well as the challenges facing the medical personnel at these zonal hospitals. This is because the rates, risk factors and challenges may not be the same as Mbeya zonal referral hospital.

On the other hand, future researches may include other hospitals in the country like regional hospitals and district hospitals to gather more information on the prevalence and risk factors associated with CP in Tanzanian hospitals. This will help to give a full picture of the current status of CP and its associated risks

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APPENDICES

Appendix 1 : Questionnaire

To Doctors & Nurses

At Mbeya Zonal Hospital.

My name is Dr. Ngassa, Anna Elizabeth, I am carrying out a research entitled **"Assessment of prevalence and risk factors for cerebral palsy: A case of Mbeya zonal referral hospital***"* in partial fulfilment of the award of MSc. Biology degree of the Open University of Tanzania.

Please note that, the information you provide will be kept confidential and will only be used for the purpose of this research and that no attempt will be made to disclose your identity.

A: RISK FACTORS ASSOCIATED WITH CEREBRAL PALSY

The following are the risk factors associated with cerebral palsy for children attending at Mbeya zonal referral hospital (Tick Yes or No)

1. Intrauterine infection 1. Yes (í   .) 2. No (í   .)

2. Malformation of cortical development 1. Yes (í   .) 2. No (í   .)

3. Premature delivery 1. Yes (í   .) 2. No (í   .)

4. Antepartum haemorrhage 1. Yes (í   .) 2. No (í   .)

5. Amnionitis 1. Yes (í   .) 2. No (í   .)

6. Neonatal meningitis1. Yes (í   .) 2. No (í   .)

7. Neonatal seizures 1. Yes (í   .) 2. No (í   .)

8. Birth asphyxia 1. Yes (í   .) 2. No (í   .)

9. Traumatic brain injury 1. Yes (í   .) 2. No (í   .)

10. Haemorrhagic stroke 1. Yes (í   .) 2. No (í   .)

11. Ischaemic stroke 1. Yes (…) 2. No (…)

12. Central nervous system infection 1. Yes (…) 2. No (…)

B: CHALLENGES FACING MEDICAL PERSONNEL WHILE HANDLING CEREBRAL PALSY CASES

The following are challenges faced by you in day to day life in handling cerebral palsy cases at Mbeya zonal referral hospital (Tick Yes or No)

13. Inadequate facilities such as seating and positioning aids and communication aids   1. Yes (…) 2. No (…)

14. Few cerebral palsy experts 1. Yes (…) 2. No (…)

15. Low income of some parents which limit them to continue with the required treatment   1. Yes (…) 2. No (…)

16. Insufficient space for cerebral palsy children 1. Yes (…) 2. No (…)

17. Mention other challenges …

C: Demographic information

18. Age i. 20 – 30 (…) ii. 31 – 40 (…) iii. 41 – 50 (…) vi. Above 50 (…)

19. Gender (i) Male (…) (ii) Female (…)

20. Marital status (i) Married (…) (ii) Single (…) (iii) widowed (…) (iv) Divorced (…)   (v) Separated (…)

21. Level of education (i) Certificate (…) (ii) Diploma (…) Bachelor degree (…) (iii) Postgraduate (…)

Thank you for your participation

Appendix II: Clearance letter

THE OPEN UNIVERSITY OF TANZANIA

DIRECTORATE OF POSTGRADUATE STUDIES

Kawawa Road, Kinondoni Municipality,
P.O. Box 23409
Dar es Salaam, Tanzania
http://www.out.ac.tz

Tel: 255-22-2666752/2668445
Ext.2101
Fax: 255-22-2668759,
E-mail:drps@out.ac.tz

Date: January 25th2018.

The Director
Mbeya Zonal Hospital
P.O.Box
Mbeya
Dodoma

RE: RESEARCH CLEARANCE

The Open University of Tanzania was established by an act of Parliament No. 17 of 1992, which became operational on the 1st March 1993 by public notice No. 55 in the official Gazette. The act was however replaced by the Open University of Tanzania charter of 2005, which became operational on 1st January 2007. In line with the later,the Open University mission is to generate and apply knowledge through research. To facilitate and to simplify research process therefore, the act empowers the Vice Chancellor of the Open University of Tanzania to issue research clearance,on behalf of the Government of Tanzania and Tanzania Commission for Science and Technology,to both its staff and students who are doing research in Tanzania. With this brief background, the purpose of this letter is to introduce to you Ms. Elizabeth Anna Ngassa PG201509999 pursuing Master of Science in Biology (MSc Biology)We hereby grant this clearance to conduct a research titled *"Assessment of medical handling of cerebral palsy in children."*. She will collect her data at Mbeya Zonal Hospital in Mbeya Region from January 29th,,2018 to Februray 30th,2018.

Incase you need any further information, kindly do not hesitate to contact the Deputy Vice Chancellor (Academic) of the Open University of Tanzania, P.O. Box 23409, Dar es Salaam. Tel: 022-2-2668820.We lastly thank you in advance for your assumed cooperation and facilitation of this research academic activity.

Yours sincerely,

Prof Hossea Rwegoshora
For: VICE CHANCELLOR
THE OPEN UNIVERSITY OF TANZANIA