



Pattern of Childhood and Adolescent Neuropsychiatry Disorders Associated with Obstetric Complications in University of Port Harcourt Teaching Hospital (UPTH)

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Authors' contributions

This work was carried out in collaboration by authors. Author AKN designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author KIG managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Obstetric complications tend to affect the immature brain which may cause or predispose to neurological or psychiatric disorder(s) in childhood or adolescence.

Aim: To determine the pattern and prevalence of childhood and adolescent neuropsychiatric disorders associated with obstetric complications in UPTH.

Methodology: This is a multi-design study, a descriptive cross sectional for assessing psychiatric illness in childhood and adolescence at the time of presentation in the outpatient clinic and this was followed by a retrospective design for mothers to recall cases associated with obstetric complications. Therefore, all cases of childhood psychiatric disorders with established and reliable history of obstetric complications as volunteered by either or both parents of affected children from January, 2013-December, 2019 were included in the study. Diagnoses were made by consultant neuropsychiatrists using the Diagnostic Statistical Manual version 5 (DSM IV) criteria. All cases

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with family history of mental illness were excluded from the study. A study questionnaire was also administered to the mothers of affected children. The results were analysed using GraphPad Prism statistical software.

Results: In all, 2182 cases of various childhood psychiatric disorders were seen within the period under study. Out of this figure, 408 (18.7%) were associated with history of obstetric complications. The most prevalent neuropsychiatric disorder was substance abuse with 17.3%, followed by depression 16.2% and then anxiety disorder 14.8%.

Conclusion: Obstetric complications have become important in childhood and adolescent neuropsychiatric disorders and is therefore important to pay more attention to steps that are necessary to prevent obstetric complications in pregnancy, labour, delivery as well as the immediate post partum.

Keywords: Pattern; childhood and adolescent; neuropsychiatric disorders; obstetric complications; UPTH.

1. INTRODUCTION

Obstetric complications are all the complications arising during pregnancy to child birth [1,2]. They may be grouped into three main categories: 1) complications of pregnancy (bleeding, preeclampsia, diabetes, and rhesus incompatibility), 2) abnormal fetal growth and development (low birth weight, congenital malformations, and small head circumference) and 3) complications of delivery (asphyxia, uterine atony, prolonged and obstructed labour, instrumental delivery, cord around the neck, and emergency Cesarean section) [1,2]. Gynecologists and obstetricians consider obstetric complications as not only those which affect future offspring mental health, but also those which impact on general women's health (e.g. puerperal infections) [1,3]. Many of these complications tend to affect the immature brain and may cause or predispose to neurological or psychiatric disorder(s) in childhood or adolescence [4,5]. There have been a number of researches on the involvement of obstetric complications in the aetiology of mental illness in affected children [6].

Obstetric complications can have significant implications for mental health in childhood, adolescents as well as later in adulthood [7-11]. Obstetric complications have been largely associated with increased risk of mental disorders [12-14]. History of complications of birth and pregnancy are more than twice as likely among children and adolescents with mental disorder [2].

It has been noted that mothers who experience severe obstetric complications such as gestational infection, maternal disease or drug exposure have a 3.7-fold increased risk of giving

birth to children with various forms of emotional illnesses [2]. Maternal pregnancy complication, perinatal risk factors and obstetric complications have been noted to cause a 1.5-2 fold increased risk of offspring being born with mental disorders or who develop emotional problems later in life [15]. A study also noted that the prevalence of offspring born with mental disorders whose mothers experienced pregnancy/childbirth complications increased from 18 individuals/1000 to 28 individuals/1000 [2]. The impact of stressful experiences during pregnancy increases susceptibility to neuropsychiatric disorders particularly in childhood and adolescent [16].

Researches on obstetric complications have become important not only in women with diagnosed mental illness, but more importantly now in the mental health of the new born both in the mentally ill as well as the healthy mothers [17-20]. The period from conception to birth and indeed the immediate perinatal and postnatal periods are key to the quality and functional development of the child [14]. Therefore, exposure of the unborn or new born in the early neonated period to any form of harsh or adverse situation may be potentially deleterious to the child.

Such harsh and unhealthy conditions can occur directly to the mother during pregnancy or may occur during the processes of labour and delivery. They range from trauma to the pregnant woman, ingestion of harmful substances such as substances of abuse and many other substances some may be intended as abortifacient to maternal illnesses like hypertension, diabetes, other endocrine diseases, bleeding in pregnancy, and other complications of labour and delivery [15]. In this delicate period, these adverse conditions have profound effects on the developing brain,

they may provide subtle insults on the brain cells and structures. The affected child may therefore manifest with one or more developmental and communication disorders [21]. In addition to direct insult and subsequent structural pathology to the brain resulting in disruption in neuronal architecture and functions, there may also be significant alteration in neurotransmitter functions.

Obstetrical complications have been observed to play crucial role in the etiology of mental disorders especially Schizophrenia, bipolar disorder, depression, anxiety disorders or substance use disorders [4,13,21-24]. However, this is currently been debated as some studies did not find enough evidence of this association in ultra-high risk patients for schizophrenia [16] and in schizophrenia patients [25]. Other studies have however demonstrated that schizophrenic patients had significantly more frequently obstetrical complications than healthy subjects [7,13,26-28]. Also, some other studies have indicated that prematurity was modestly associated with the risk to develop schizophrenia [20]. In addition, cesarean delivery was found to increase the risk of bipolar disorder in a Finnish sample [29], while other studies did not find any significant differences between bipolar patients and healthy controls in terms of obstetrical complications [13].

Obstetrical complications have been associated with psychotic or mood disorders [12,22,30,31] and equally found the most common obstetrical complications to be prolonged labor (more than 36 hours), abnormal gestational age < 37 weeks or > 42 weeks, and complicated caesarian delivery [26]. Another study found cesarean delivery to result in the most common obstetrical complication in patients with subthreshold psychotic symptoms as against healthy controls [6].

Perinatal insults tend to present with an earlier age at onset of neuropsychiatric illness, although this has always been moderated by an earlier access to the mental health services (e.g. neuropsychiatry) [31]. Obstetrical complications could have an “anticipatory effect” (possibly determining early presentation of psychiatric disorders in subjects with a predisposition to mental illness). It seems that obstetric complication can give an adjunctive vulnerability to develop earlier psychiatric disorders [32]. This tends to confirm previous findings outlined in

patients with schizophrenia or mood disorders [33]. This study was indicated as there is dearth of literature on the role of obstetric complications in the development of childhood mental illness in this environment.

1.1 Aim

To determine the pattern and prevalence and pattern of childhood neuropsychiatric disorders associated with obstetric complications in UPTH.

2. METHODOLOGY

This is a multi-design study, a descriptive cross sectional for assessing psychiatric illness in childhood and adolescence at the time of presentation in the outpatient clinic and this was followed by a retrospective design for mothers to recall cases associated with obstetric complications. Therefore, all cases of childhood psychiatric disorders with established and reliable history of obstetric complications as volunteered by either or both parents of affected children from January, 2013-December, 2019 were included in the study. Diagnoses were made by consultant neuropsychiatrists using the Diagnostic Statistical Manual version 5 (DSM IV) criteria [34]. All cases with family history of mental illness were excluded from the study. A structured open ended study questionnaire was also administered to the mothers of affected children. The results were analysed using GraphPad Prism statistical software.

2.1 Limitation of the Present Study

1. Retrospective design: the collection of data could have been inaccurate in some cases due to recall bias by parents and/or subjects, and therefore not a good measure of causality.
2. Age of the parents at the time of birth of the children could be a major confounder, as it is known that the very young teenage mothers may be prone to difficult delivery while the older mothers or parents are more likely to have babies with birth anomalies.

3. RESULTS

In all, 2182 cases of various childhood psychiatric disorders were seen within the period under study. Out of this figure, 408 (18.7%) were associated with history of obstetric complications.

Table 1. Showing socio-demographic characteristics of mothers of affected children

Variable	No. of Patients	Percentage (%)
Age range of mothers and number of affected children		
15-24	142	4.8%
25-34	118	28.9%
35-44	80	19.6%
45-54	58	14.2%
Total	408	100%
Level of Education of the mothers and number of affected Children		
Level of Education	No. of Patients	%
Primary	114	28.1
Secondary	158	39.0
Tertiary	89	21.7
No education	47	11.2
Total	408	100
Marital status of mothers and number of affected children		
Married	216	63.6
Unmarried	104	27.3
Divorce	31	3.6
Separated	24	1.3
Widowed	33	4.2
Total	408	100
Occupation of mothers and number (%) of affected children		
Civil servants	59	15.6
Company workers	58	14.6
Businesswomen	44	8.8
Skill workers	69	19.2
Petty traders/ farmers	86	19.8
unemployed	93	20.1
Total	408	100

Table 2. Showing involvement of obstetric complications in psychiatric disorders

Obstetrics complication	No. of psychiatric disorder	%of psychiatric disorder
Difficult birth/delivery (Prolonged, obstructed, breach)	102	25.0
Cesarean Section	76	18.6
Mothers with low grade fever in pregnancy (infections/ parasitama)	13	3.2
Preterm/premature/low birth weight	54	13.2
Hyperemesis gravidarum	24	5.9
Premature rupture of membrane	25	6.1
Placenta abruptio	16	3.9
Pre-eclampsia/eclampsia	27	6.6
Maternal anaemia and other diseases	29	7.1
Birth anomaly	7	1.7
Total	408	100%

3.1 Involvement of Obstetric Complications in Psychiatric Disorders

Difficult birth/delivery (Prolonged, obstructed, breach) was involved in the majority of cases of psychiatric disorders with 102(25.0%) of all cases of mental disorders in the study. This was

followed by complicated Cesarean Section (indicated for reasons other than prolonged or obstructed labour as well as breach presentations), with 76(18.6%) and preterm/premature/low birth weight babies with 54 (13.2%), birth anomaly was the least with 7(1.7%).

3.2 Psychiatric Disorders Associated with Obstetric Complications

The most prevalent psychiatric disorder was substance abuse with 17(17.6%), followed by depressive illness 69(16.9%), anxiety disorders with 61(14.9%), learning disability with 45(11.07%), while Down Syndrome was the least with 1(0.2%).

4. DISCUSSION

This study is a further scientific attempt to throw more light to the previous observations that adverse conditions like maternal infections during pregnancy, various forms of obstetric complications, infections such as meningitis, encephalitis, cerebral malaria of the child in the early neonatal and infancy are potentially capable to either slow down or even stagnate the neurodevelopment of the child [21,35]. A number of etiological mechanisms have been postulated to explain the association between obstetric complication and the development of psychiatric illness [36-38]. Reduction in the supply of nutrients, such as oxygen, iodine, glucose, and iron, to the fetus may lead to impaired development of the CNS [31] as well as intrauterine growth restriction. In these cases, the lack of metabolites and states of hypoxia are

repeated over time and the basal ganglia is at particular risk of being damaged [37].

Prematurity increases the risk for intracranial hemorrhages [38-40], periventricular leukomalacia [4] and also for interstitial respiratory distress syndrome and infections [4], which may also cause brain damage. Also, hypoxia or ischemia due to complications during delivery could result in brain damage, especially in the regions of the hippocampus and cortex [4].

In this study, a significant majority of the disorders were associated with birth difficulties. 62% of cases were associated with difficult birth including cephalopelvic disproportions resulting in prolonged and or obstructed labour, which often ended in caesarean sections. Others included breech which sometimes led to instrumental deliveries with subsequent severe birth asphyxia.

This may imply that most of the impact of the insults from obstructed or prolonged labour was significantly felt on the brain. This may have interrupted the normal neurodevelopment of the new born [24]. Learning disorders were most prevalent and this may be connected to the huge global cognitive impairment which is known to occur with different obstetric complications investigated in this study [41].

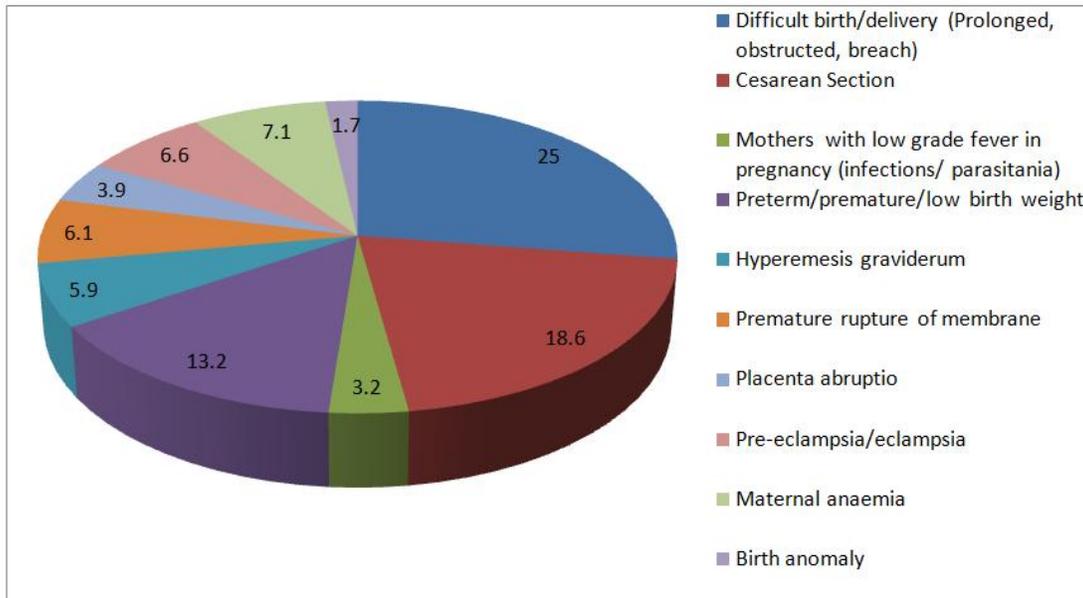


Fig. 1. A pie chart showing involvement of obstetric complications in the etiology and psychiatric disorders

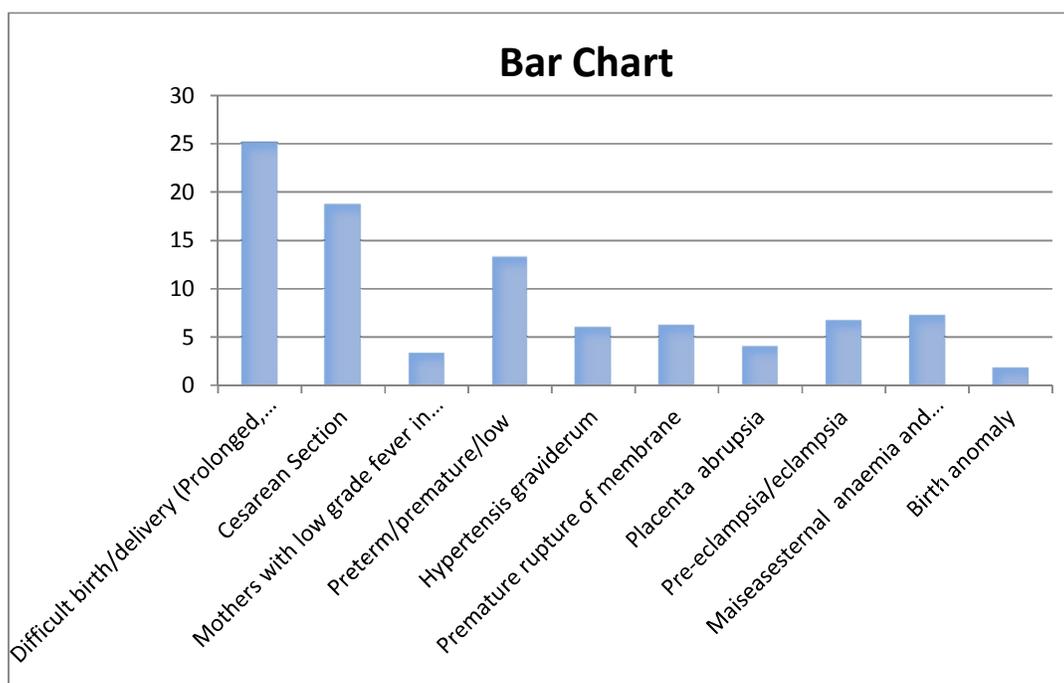


Fig. 2. A bar chart showing involvement of obstetric complications in the etiology and psychiatric disorders

Table 3. Childhood and adolescent psychiatric disorders associated with obstetric complications

Childhood and adolescent psychiatric disorders	Frequency	Percentage (%)
Learning disability	45	11.07
Learning disorders	31	7.6
Communication disorders	22	5.3
Depressive disorders	69	16.9
Anxiety disorder	61	14.9
Schizophrenia and other psychotic illnesses	29	7.1
Bipolar Affective Disorder	35	8.6
Cerebral palsy	4	0.9
Conduct disorders	12	2.9
ADHD	17	4.1
Down syndrome	1	0.2
Acute Stress Disorder	9	2
Substance abuse	72	17.6
Total	408	100%

Twenty seven percent of cases occurred in children whose mothers had low grade fever, due to pre- and perinatal plasmodia parasitaemia and microbial infections, particularly in the first trimester. This finding is in line with earlier association of infections particularly viral infection with schizophrenia and depression. Childhood encephalitis has been associated with laying a vulnerable foundation for developing mental illness in adult due to inflammation which may

cause the release of toxic substances including free radicals [35]. Maternal illnesses including gestational diabetes and influenza were also common and have been associated with increased risk of premature birth (an obstetric complication) and increased motional violence during pregnancy [8,23]. Furthermore, it has been suggested that prenatal infections increase risk of childhood or adolescent mental illness through stimulation of the cytokine response,

which would disrupt central nervous system development [5], and this would explain why several infections seem to increase the risk of schizophrenia and other mental illnesses [8,23]. Elevated cytokine levels in mothers of offspring who developed schizophrenia have been observed from both first, second and third trimester samples [5,12,23,42].

From the study, 11% of cases were seen in children whose mothers had severe anaemia in pregnancy and the impact of this on the cerebral functions of the growing fetus may be damaging due to reduced placental blood perfusion. The study also found 42% of the cases was properly booked in hospital and had their deliveries therein while 21% of deliveries were in churches and 16% in traditional birth attendants (TBA) home. Deliveries in unlicensed facilities may be prone to obstetric problems not only due to absence of expertise but standard guidelines and hygienic and aseptic procedures may not be followed.

From the study, pre-eclampsia and eclampsia constituted about 6.6%. The basis of pre-eclampsia in causing insult to the fetus involves the mechanism of abnormal fetal blood flow resulting in chronic fetal hypoxia or malnutrition [43]. In addition, gestational hypertension and preeclampsia cause placental lesions, eg, fibrin deposits and knots, which are qualitatively similar although more severe in preeclampsia. Therefore children whose pregnancy and or deliveries were complicated with pre-eclampsia or eclampsia may tend to have psychiatric disorders. Bleeding during pregnancy has many causes including implantation bleeding and abnormal menses are common in the first month, and placenta praevia and premature separation of the placenta are frequent causes in the last month. The causes of mid-pregnancy bleeding are less well understood. In this study, cases of placenta abruption as a cause of bleeding in pregnancy represented 3.9%. This was lower compared to finding in other studies [44]. In severe cases of bleeding, the pathogenic effect on the fetus is thought to be anoxia, which may serve as a predisposition to childhood psychiatric illness. Furthermore, studies have also revealed the placenta as a transient source of serotonin for the fetal forebrain [24]. However, in many cases, the amount of bleeding may be slight [45] and anoxic brain damage is unlikely.

Another common obstetric complication found in the study was elective and emergency

caesarean section constituting 18.6%. A study had associated specific obstetric complications of planned caesarean section with a 2.5-5-fold increased risk of psychotic/bipolar disorder [29], while another paper found a 2.7-fold increase risk in case of preterm birth [11]. Furthermore, very fewer studies have implicated obstetric complications in the etiology of major depressive disorder (Schmitt et al., 2014). Of the total number of women who went to churches and TBA, 18% of the cases was referred to tertiary hospitals due to complications. From the study, 50% of cases were associated with teenage and young adult pregnancy, most of whom were unwanted.

The study found 7.1% of the cases were schizophrenia and other psychotic illnesses. Schizophrenia with quite early onset usually have their etiology associated with obstetric complication or clearly familial and tend to carry poor prognosis as they are insidious with tendency of gross nerve abnormality [46,17,7,47]. Also, poor treatment response has been reported in schizophrenia patients with a history of obstetric complication [48]. Obstetric complications, particularly those that result in reduced oxygen supply to the brain, often have the tendency for increased risk of developing psychosis [49]. In a study, 3 obstetric complications were noted to predict future development of schizophrenic spectrum psychosis and these include placental abnormalities, infections and hypertension during pregnancy [50]. In this study, these 3 factors were equally noted to be common. The postulated pathophysiological mechanism is that involving a reduction in or lack of oxygen supply to the brain cell. Early hypoxia have been found to cause acute toxemia from generation of free radicals and this is capable of causing an abnormal brain development during childhood.

Bipolar affective disorder was 8.6% and same pathophysiological mechanism involving also a denial of oxygen supply to the brain cell resulting in hypoxia have been implicated. As earlier noted preterm birth and caesarean sections are strong predispositions to adolescent bipolar affective disorders [24]. Some other studies however have had reservation concerning the role of obstetric complications in the etiology of bipolar disorder [51]. A systematic review failed to establish any robust evidence to show that exposure to obstetric complications increases the risk of developing bipolar disorder [51]. Some other studies have rather opined that obstetric

complication appears to be more related to specific mental disorders such as bipolar subtypes especially the early-onset [32] or psychotic ones like schizophrenia [52-58].

Substance abuse was the most common mental problem found in the study and this support earlier findings of the role of brain abnormality and dysfunctional neurotransmitter system in the aetiology of substance abuse [38]. The findings of atrophy in the hippocampus, basal ganglia and amygdala and other part of the limbic system in some chronic drug users and schizophrenics on structural and functional neuroimaging studies have learned credence to this hypothesis [38,59-61]. Structural neuroimaging has demonstrated cortical atrophy more often in schizophrenia, bipolar affective disorder, chronic drug users and patients with psychotic depression with history of obstetric complications than in patients without perinatal insults [59-64].

Three different studies noted that preterm birth was associated with a higher risk of a depressive and anxiety disorders in adolescence [27] or adulthood [10,30]. In this study, depression was the second most common illness followed by anxiety disorders. The important functions of the limbic system which is to subserve normal mood and emotions may be altered with high impact of severe obstetric complication.

From a patho-physiological perspective, though it is unclear whether obstetric complications are injuries that alter brain development or, vice versa, they are an early sign of a predisposition to psychiatric disorders [51]. In addition, it is not determined whether obstetric complications are associated with a specific psychiatric diagnosis or are generally a risk factor for psychiatric disorders [9]. Although some studies have linked specific obstetric complications to specific mental disorders such as cesarean delivery and subsequent increased risk of psychotic/bipolar disorders [6,29,64]. On a large scale, longitudinal studies are required to establish predisposition of obstetric complications to specific mental illness.

5. CONCLUSION AND RECOMMENDATIONS

Obstetric complications may predispose to abnormality and abnormal brain functions with subsequent childhood or adolescent mental illnesses. Future prospectively studies may however be useful to collect precise data about mental health of offspring with a history of

obstetrical complications and to reduce the risk of developing specific psychiatric disorder. As noted earlier, it could be possible to reduce the risk of severe mental disorders in some genetically at-risk individuals by careful prenatal and perinatal monitoring. Finally, the inclusion of obstetric complications in multiple risk assessments for psychosis development could further enhance the ability to identify those individuals that could benefit from early psychiatric intervention.

CONSENT

It is not applicable.

ETHICAL APPROVAL

Approval for this study was obtained from the ethical committee of the hospital.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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