

Effect of Educational Intervention on Knowledge and Awareness about Childhood Neurodevelopmental Disorders among Mothers attending Immunization Clinics in Lagos State, Nigeria

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Abstract

Background

Knowledge and awareness about childhood neuro developmental disorders (NDD) could help in early diagnosis and interventions for affected children and thus improve the prognosis. Such knowledge and awareness could also serve a purpose of prevention by ensuring that potential and nursing mothers avoid the possible risk factors of having a child with NDD. The study assessed the effect of educational intervention on knowledge and awareness about childhood NDD among nursing mothers attending immunization clinics in Lagos State, Nigeria.

Method

Socio-demographic and Knowledge and Awareness about Childhood Neuro developmental Disorders (KACNDD) questionnaires were administered to 2,893 mothers at baseline and immediately after the educational intervention. An initial pilot study was done to test the reliability and internal consistency of KACNDD questionnaire.

Results

KACNDD questionnaire showed good test-retest reliability in the pilot study with inter-domain correlations of 0.90, 0.84, and 0.86 for domains 1, 2 and total score respectively. KACNDD questionnaire also had good internal consistency with Chronbach alpha of 0.84. For the main study involving 2,893 mothers, the difference between the total mean scores on KACNDD questionnaire at baseline and post-educational intervention was statistically significant ($t = -50.33$, $df = 2892$, $p = 0.000$).

Conclusion

Educational intervention showed significant positive effect on knowledge and awareness about childhood NDD among mothers in this study. Promoting knowledge and awareness about childhood NDD among potential and nursing mothers in sub-Saharan African region would be of immense benefit. Immunization clinics across the region would serve as good avenues to reach out to the mothers.

Keywords: Knowledge; Awareness; Childhood; Neuro developmental Disorders; Education

Background

Neuro developmental disorders (NDD) are group of disorders arising from impairments in the developing brain and/or the central nervous system. They are considered neuro developmental in that by definition they originate during the developmental period, that is, during the prenatal, ante-natal, post-natal, infancy and early childhood periods [1]. The disorders have varying degrees of associated burden on children, their families and their communities and almost always require multi-faceted services to address special educational, health care, social inclusion and rehabilitation needs [1].

The NDD include intellectual developmental disorders with known genetic or metabolic etiologies, traumatic or congenital brain injuries including conditions such as cerebral palsy, as well as prenatal exposures such as fetal alcohol syndrome, and disorders of social relatedness such as autism spectrum disorders [1].

With the declining under-five mortality in recent years, report suggests a possible future high prevalence paradigm shift from communicable diseases to childhood neuro developmental disorders in Sub-Saharan Africa as more children survive beyond the age of five years [1].

It is not clear how much the parents and the general populace know about childhood neuro developmental disorders. Having fair knowledge about childhood neuro developmental disorders could help in parents raising early developmental concerns about their children and thus early identification or diagnosis of specific neuro developmental disorder in affected children. At least the mothers can report on time developmental concerns about the children. This in turn can promote early interventions, which had been documented to improve prognosis [2-4]. It could also help

mothers to avoid pre-natal, antenatal and postnatal health behaviors that can result in having children with neuro developmental disorders. Hence, having fair knowledge and awareness about childhood neuro developmental disorders can ensure prevention and early interventions, which are multidisciplinary in approach [5]. There is no better way to improve knowledge other than educational interventions aimed at promoting awareness.

To the best of Authors knowledge, there are no preceding studies that examined knowledge about childhood neuro developmental disorders in broad spectrum as done in this present study.

This study assessed the effect of educational intervention on knowledge and awareness about childhood neuro developmental disorders among mothers bringing their children for immunization at immunization clinics in two randomly selected Local Government Areas in Lagos State, Nigeria.

This is a cross-sectional study and part of a larger project titled, “**Early Identification and Intervention for Childhood Neuro developmental Disorders among Children under the age of 3 years in Lagos State, Nigeria**”. This project incorporates screening and interventional follow-up for neuro developmental disorders among children under the age of three years. Prior to now, data are not available regarding the prevalence and pattern of neuro developmental disorders among young children under the age of 3 years in Nigeria and other sub-Saharan African countries. This is as a result of late diagnosis and interventions that characterized neuro developmental disorders in this region, with earliest diagnoses often made at school age between the ages of 6 and 8 years, leading to late interventions for these children [6].

Immunization clinics at the primary healthcare level constitute major source of clinical convergence for children under the age of 3 years and their mothers. Such clinics also afford the opportunity for early screening of neuro developmental delay among these children in a less stigmatizing setting. This in turn provide opportunity for early clinical evaluation with the objectives of making definitive clinical diagnosis and need assessments of such children for the purpose of planning early interventions, which had been documented to improve prognosis [2-4].

As part of this larger project, mothers were provided with educational intervention about childhood neuro developmental disorders and the effect of this educational intervention on mothers' knowledge was assessed using Knowledge and Awareness about Childhood Neuro developmental Disorders (KACNDD) questionnaire.

Methods

Location

The locations of the study were immunization clinics located in two randomly selected Local Government Areas (LGA) of Mushin and Oshodi in Lagos State, Nigeria. Healthcare service in these Local Government Areas is under the supervision of the Lagos State Primary Health Care Board in Nigeria.

Ethical Consideration

The ethical approval for the study was obtained from the Ethical Review Committee of Federal Neuropsychiatric Hospital, Yaba, Lagos. Study procedure was well explained to the participants and consent of individual participant was obtained.

Participants and Sampling Method

Mothers of children brought to the immunization clinics in two LGAs of Mushin and Oshodi in Lagos State, Nigeria were involved in the study. Consecutive mothers bringing their children to the clinics for immunization were approached to complete the study questionnaires over a one year period. Immunization clinics are opened twice a week in these LGAs. Out of a total of 3,011 mothers approached to complete the study questionnaires, only 2,893 (96%) gave their consent and completed both the pre-educational intervention and post-educational intervention questionnaires.

Materials

Socio-demographic Questionnaire – This was used to obtain basic demographic information like sex, age, educational status of the mothers among other information.

Knowledge and Awareness about Childhood Neuro developmental Disorders (KACNDD) Questionnaire –

This questionnaire was designed by the researchers after focus group discussion with a group of multi-disciplinary professionals involved in the area of neuro developmental disorders. This questionnaire is divided into two main domains:

Domain 1 - contains 6-item questions that addressed symptoms associated with childhood neurodevelopmental disorders.

Domain 2 - contains 8-item questions that addressed possible aetiologies of childhood neurodevelopmental disorders.

In a pilot study, the face validity of Knowledge and Awareness about Childhood Neuro developmental Disorders (KACNDD) questionnaire was determined by a group of multi-disciplinary professionals who are experienced in providing interventions for children with neuro developmental disorders following a focus group discussion. The KACNDD questionnaire was piloted among twenty (20) mothers bringing their children to immunization clinics in south-eastern Nigeria during the experimental introduction of depression and developmental screening into immunization clinics in this region [7]. In this pilot study, the mean scores of KACNDD questionnaire at baseline and after two weeks were compared to assess the test-retest reliability of KACNDD questionnaire and internal consistency was determined by calculating the Chronbach Alpha. Inter-domain correlation coefficient (r) for domains 1, 2 and total scores were 0.90, 0.84 and 0.86 respectively. The Chronbach Alpha for standardized items was 0.84. Table 1 showed comparison of mean scores in the two domains of KACNDD questionnaire. Table 2 showed inter-domain correlation matrix in the piloted study. The outcome of this pilot study showed that KACNDD questionnaire is a useful and reliable tool for assessing knowledge and awareness of the mothers about childhood neuro developmental disorders in an immunization clinic setting. Minimum and maximum total scores of 0 and 14 are possible respectively on KACNDD questionnaire. The KACNDD questionnaire and its scoring method are included as Appendix 1.

Table 1: Domain Mean Scores (Pilot Study for KACNDD questionnaire)

Domains	Mean	Std. Deviation	N
Domain 1A	5.5500	0.51042	20
Domain 2A	7.4500	0.51042	20
Total A	13.0000	0.64889	20
Domain 1B	5.6000	0.50262	20
Domain 2B	7.4500	0.60481	20
Total B	13.0500	0.75915	20

A – KACNDD administration at baseline

B – KACNDD administration after two (2) weeks

Table 2: Inter-domain Correlation Matrix (Pilot Study for KACNDD questionnaire)

Domains	Domain1A	Domain2A	Total A	Domain1B	Domain2B	Total B
Domain 1A	1.000	-0.192	0.636	0.903	-0.162	0.469
Domain 2A	-0.192	1.000	0.636	-0.082	0.844	0.618
Total A	0.636	0.636	1.000	0.645	0.536	0.855
Domain 1B	0.903	-0.082	0.645	1.000	-0.069	0.607
Domain 2B	-0.162	0.844	0.536	-0.069	1.000	0.751
Total B	0.469	0.618	0.855	0.607	0.751	1.000

Chronbach Alpha = 0.84

A – KACNDD administration at baseline

B – KACNDD administration after two (2) weeks

Main Study - Administration of KACNDD Questionnaire on a large scale to assess effect of Educational Intervention

Procedure

Socio-demographic questionnaire and KACNDD questionnaire were administered to the mothers at baseline upon their arrival and registration at the immunization clinics. Following registration, the mothers usually undergo routine health talks that last between one to two hours before commencement of immunization and anthropometric measurement of the children. This period of health talks were used to pass information to the mothers about childhood neuro developmental disorders. The health talks were given by Primary Healthcare Nurses who had earlier been trained about screening and identification of childhood neuro developmental disorders at immunization clinics. The health talks followed the guidelines highlighted in the childhood neuro developmental disorders educational flyers

designed for the purpose. The health talks consist of both didactic and participatory components, where mothers are allowed to ask questions and clarify issues that are not clear. The educational flyers were also distributed freely to the mothers to read. A sample of the educational flyer used as guideline for the health talks at the immunization clinics is included as Figures 1 and 2.

This study is part of a project titled, “**Early Identification and Intervention for Childhood Neuro developmental Disorders among Children under the age of 3 years in Lagos State, Nigeria**” supported by **Grand Challenges Canada (GCC)**.

After the period of health talks, immunization process and anthropometric measurements for the children, which lasted an average of about three hours for each mothers, the mothers completed the KACNDD questionnaire the second time. A total of 2,893 mothers out of 3,011 mothers approached gave their consent and completed the pre-educational intervention and post-educational intervention KACNDD questionnaires over the study period.

Figure 1: Educational Flyer Page 1

nutritional deficiency include mild mental retardation and fetal alcohol syndrome.

- **Trauma** – Brain trauma in a developing human is a common cause of CNDD. This can be divided into congenital injury resulting from hypoxia (lack of oxygen to the brain at birth), mechanical trauma of birth process itself such as Instrument delivery. Others are traumas occurring in infancy and childhood such as fall from an height and other forms of head injuries.
- **Toxic and Environmental Factors** – Heavy metal poisoning is a common cause of CNDD. The toxic metals may include Lead, Mercury among others.

Poisoning by heavy metals may lead to nerve damage, visual impairment, problems with co-ordination/ambulation among others. Toxic substances that can lead to CNDD may also include prescribed and over the counter drugs that can cause congenital malformations.

PARENTS AND TEACHERS SHOULD WATCH OUT FOR THESE VARIOUS FACTORS TO PREVENT CHILDHOOD NEURODEVELOPMENTAL DISORDERS (CNDD)

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CHILDHOOD NEURODEVELOPMENTAL DISORDERS (CNDD)

What are Childhood Neurodevelopmental Disorders (CNDD)?

These are disorders caused by impairment in the growth and development of the brain or central nervous system. Examples of Childhood Neurodevelopmental

Figure 2: Educational Flyer Page 2

Disorders (CNDD) include Down Syndrome, Cerebral Palsy, Autism Spectrum Disorders, Communication and Language Disorders, Fragile-X Syndrome among others. CNDD usually affect a child's developmental milestones such as seeing, hearing, talking, sitting, crawling, walking and general interaction with other children, adults and the environment.

CNDD may arise from a number of causes which include:

- **Parental and Social Deprivation** – CNDD may arise from lack adequate nurture and emotional care from the caregiver(s). Social deprivation could occur as a result of sensory deficits such as visual and hearing impairments.
- **Genetic Disorders** – CNDD may arise from genetic disorders. Examples include Trisomy 21 (Down Syndrome); Fragile-X Syndrome among others.
- **Immune Dysfunction** – Sometimes there may be immune reaction during pregnancy between the mother and the fetus because of some genetic incompatibility and this may lead to developmental problems resulting in CNDD when the child is born and growing.
- **Infectious Diseases** – CNDD may result from congenital infectious diseases such as toxoplasmosis, syphilis among others. In infancy and childhood, infectious diseases such as measles, meningitis, rubella among others may lead to CNDD.
- **Metabolic Disorders** – Metabolic disorders in the mothers like maternal diabetes mellitus may lead to CNDD. In-born error of metabolism in the child, such as phenylketonuria may also lead to CNDD.
- **Nutrition Deficiency** – Nutritional deficiency may be responsible for CNDD such as Neural tube defects, examples of which include Spina bifida and Anencephaly. Deficiency of folic acid and Vitamin Bs, which could be derived from vegetables, fruits and milk products are often responsible for these defects. Iodine deficiency may also be implicated for CNDD ranging from mild emotional disturbance to severe mental retardation. Other examples of CNDD that may result from

Data Analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS), version 16. The mean scores of KACNDD questionnaire were compared using paired sample t-test and correlation between the mean scores was determined.

Results

A total of 2,893 mothers participated in the study. The minimum and maximum ages of the mothers were 15 and 52 years respectively and the mean age was 29.9 ± 5.2 years. A total of 197 (6.8%), 1,616 (55.9%) and 1,080 (37.3%) of the mothers completed primary, secondary and post-secondary education respectively.

Table 3: Comparison of Pre- Educational Intervention and Post-Educational Intervention Mean Scores on KACNDD Questionnaire (Main Study)

KACNDD Questionnaire	N	Mean	Paired Sample T-test	Correlation
Pre- Educational Intervention	2,893	7.16 ± 5.50	$t = - 50.53$ $df = 2892$	$r = 0.005$
Post- Educational Intervention	2,893	12.91 ± 2.72	$p = 0.000$	$p = 0.778$

Discussion

In the piloted study, KACNDD questionnaire showed good test-retest reliability as reflected in inter-domains and total scores correlations. It also reflected a good internal consistency with Chronbach alpha of 0.84. In the main study, educational intervention as guided by information on educational flyers about childhood neurodevelopmental disorders had significant effect on knowledge of the mothers about childhood neurodevelopmental disorders as reflected by the significant difference in the mean scores of pre-educational and post-educational interventions on KACNDD questionnaire.

Limitation

There is dearth of study that had addressed the issue of knowledge and awareness about childhood neurodevelopmental disorders in broad terms as done by this study, most previous studies had focused specifically on autism spectrum disorders (ASD) [5,8-11]. Hence, there is limitation of non-availability of studies to compare our present findings. The objective of our broad focus on childhood neurodevelopmental disorders is to enable the mothers to notify on time healthcare workers about developmental concerns in their children, so that extensive evaluation aimed at making specific diagnosis can be done.

As earlier indicated, this is a cross-sectional study and part of a larger project of which the detail follow-up

Mean Scores of Pre-Educational Intervention and Post-Educational Intervention on KACNDD Questionnaire

Table 3 showed the comparison of total mean scores of pre-educational and post-educational intervention on KACNDD questionnaire and the correlation coefficient. The total pre-educational intervention mean score and post-educational intervention mean score were 7.16 ± 5.50 and 12.91 ± 2.72 respectively. The difference between the total mean scores of pre-educational and post-educational intervention on KACNDD questionnaire was statistically significant ($t = - 50.53$, $df = 2892$, $p = 0.000$). The correlation between pre-educational mean score and post-educational mean score is 0.005. See Table 3.

intervention outcomes for children under the age of three years screened positive for neurodevelopmental delays would be reported in the near future.

Conclusions

As earlier noted, promoting knowledge and awareness about childhood neurodevelopmental disorders could serve a preventive measure, reducing the risk of having children with neurodevelopmental disorders and could ensure early diagnosis and interventions, which had been known to improve prognosis [2-4]. It would be beneficial if knowledge and awareness about childhood neurodevelopmental disorders can be promoted among potential and nursing mothers in Nigeria and other Sub-Saharan African countries. Immunization clinics across the region provide clinic convergence for mothers and children and could serve as good avenues to reach out to these mothers and their children.

Competing Interests

The Authors received funding from Grand Challenges Canada (GCC)

Authors' Contribution

All Authors contributed to the conception of the study. MOB wrote the initial draft of the manuscript. All Authors are involved in revising the manuscript. All Authors read and approve the final draft of the manuscript.

Appendix 1

Knowledge and Awareness about Childhood Neurodevelopmental Disorders (KACNDD) Questionnaire

Domain 1

1. A Neurodevelopmental Disorder is a disorder of brain development:
(A) YES; (B) NO; (C) DON'T KNOW
2. A Neurodevelopmental Disorder occurs in:
(A) CHILDHOOD/INFANCY; (B) ADULTHOOD (C) DON'T KNOW
3. A Neurodevelopmental Disorder may affect a child's muscle activities like crawling/walking:
(A) YES; (B) NO; (C) DON'T KNOW
4. A Neurodevelopmental Disorder may affect a child's communication, speech and language:
(A) YES; (B) NO; (C) DON'T KNOW
5. A Neurodevelopmental Disorder may affect Emotion and Cognition of a child:
(A) YES; (B) NO; (C) DON'T KNOW
6. A Neurodevelopmental Disorder may affect a child's physical/facial appearance:
(A) YES; (B) NO; (C) DON'T KNOW

Domain 2

7. A Neurodevelopmental Disorder may result from social-deprivation:
(A) YES; (B) NO; (C) DON'T KNOW
8. A Neurodevelopmental Disorder may result from genetic disorder:
(A) YES; (B) NO; (C) DON'T KNOW
9. A Neurodevelopmental Disorder may result from Immune dysfunction:
(A) YES; (B) NO; (C) DON'T KNOW
10. A Neurodevelopmental Disorder may result from childhood infectious diseases:
(A) YES; (B) NO; (C) DON'T KNOW
11. A Neurodevelopmental Disorder may result from inadequate/abnormal Nutrition:
(A) YES; (B) NO; (C) DON'T KNOW
12. A Neurodevelopmental Disorder may result from Trauma:
(A) YES; (B) NO; (C) DON'T KNOW
13. A Neurodevelopmental Disorder may result from Metabolic disorder:
(A) YES; (B) NO; (C) DON'T KNOW
14. A Neurodevelopmental Disorder may result from Toxic and Environmental factors:
(A) YES; (B) NO; (C) DON'T KNOW

Knowledge and Awareness about Childhood Neurodevelopmental Disorders (KACNDD) Questionnaire – Scoring Method

Domain 1

1. A Neurodevelopmental Disorder is a disorder of brain development:
(A) 1; (B) 0; (C) 0
2. A Neurodevelopmental Disorder occurs in: (A) 1; (B) 0; (C) 0
3. A Neurodevelopmental Disorder may affect a child's muscle activities like crawling/walking:
(A) 1; (B) 0; (C) 0
4. A Neurodevelopmental Disorder may affect a child's communication, speech and language:
(A) 1; (B) 0; (C) 0
5. A Neurodevelopmental Disorder may affect Emotion and Cognition of a child:
(A) 1; (B) 0; (C) 0
6. A Neurodevelopmental Disorder may affect a child's physical/facial appearance:
(A) 1; (B) 0; (C) 0

Domain 2

7. A Neurodevelopmental Disorder may result from social-deprivation:
(A) 1; (B) 0; (C) 0

8. A Neurodevelopmental Disorder may result from genetic disorder:
(A) 1; (B) 0; (C) 0
9. A Neurodevelopmental Disorder may result from Immune dysfunction:
(A) 1; (B) 0; (C) 0
10. A Neurodevelopmental Disorder may result from childhood infectious diseases:
(A) 1; (B) 0; (C) 0
11. A Neurodevelopmental Disorder may result from inadequate/abnormal Nutrition:
(A) 1; (B) 0; (C) 0
12. A Neurodevelopmental Disorder may result from Trauma:
(A) 1; (B) 0; (C) 0
13. A Neurodevelopmental Disorder may result from Metabolic disorder:
(A) 1; (B) 0; (C) 0
14. A Neurodevelopmental Disorder may result from Toxic and Environmental factors:
(A) 1; (B) 0; (C) 0

A Maximum Total Score of 14 and a Minimum Score of 0 is possible

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