



Diseases Associated to the Treatment of Malnutrition in Children in Developing Countries: Case of the Wikong Therapeutic and Nutritional Intensive Care Unit in Democratic Republic of Congo

Egnon KV Kouakou^{1*}, Biaya D Baloji², Badiambile R Mpulumba³, Nankomo Mudimbiyi³, Guy IM Sakaji³, Kalubi Mbaya^{5,6}, Banza J Kabongo⁵, Tshite J Tshite⁷ and Ayinin Sanni⁸

¹Pharmacology and Nutrition Laboratory, UFR Biosciences, Felix Houphouët-Boigny University, Abidjan, Ivory Coast, Côte d'Ivoire

²Institute of Medical and Technical Sciences of Tshilenge, Tshilenge territory, Province of Eastern Kasai, Democratic Republic of Congo

³Faculty of Public Health, Official University of Mbuji mayi, Province of Eastern Kasai, Democratic Republic of Congo

⁴University of Mwene Ditu, Province of Lomami, Democratic Republic of Congo

⁵Institute of Medical and Technical Sciences of Mbuji mayi, City of Mbuji mayi, Province of Eastern Kasai, Democratic Republic of Congo

⁶Nutrition National Program in the Province of Eastern Kasai, Democratic Republic of Congo

⁷Institute of Medical and Technical Sciences of Lubao, Lubao territory, Province of Lomami, Democratic Republic of Congo

⁸Assana Consulting, Republic of Benin

***Corresponding Author:** Egnon KV Kouakou, Pharmacology and Nutrition Laboratory, UFR Biosciences, Felix Houphouët-Boigny University, Abidjan, Ivory Coast, Côte d'Ivoire. **E-mail:** dbbiaya@gmail.com, kouakouegnonvivienn@yahoo.fr

Received: July 23, 2020

Published: September 11, 2020

© All rights are reserved by **Egnon KV Kouakou., et al.**

Abstract

Malnutrition is basically the backdrop whereon a good number of diseases can be grafted. The objective of this work is to determine frequently contracted infections by malnourished children in line with the information supplied by the Nutritional Management Programs.

Furthermore, we carried out a retrospective band study of malnourished children of 0 to 59 months of age, who were admitted in the WIKONG Therapeutic and Nutritional Intensive Care Unit from 6th August 2019 to 31st March 2020. The collected data were first encoded on the table sheet of Excel Microsoft Software package and then imported for their processing on the Epi info™ 7.2.3.1 software package (CDC, 2019).

In the aggregate, 42 children were included in the study. We registered a proportion of 62% of malnourished she-infants against 38% of malnourished he-ones. The majority of malnourished children were aged between 6 and 23 months (59,52%). The average age was of 15,52 ± 11,43 months. The most current consultations reasons were: cough (76,19%), loss of appetite and fever (73,81%), diarrhea (40,48%), hypoglycemia (35,71%), but the suspected diseases were malaria (57,14%), persistent enteritis (23,81%) and mouth candidiasis (19,05%). Girls alone represented 64% of the whole set of malnourished children with edema.

A quick treatment of the malnourished children, a good identification and better management of these malnutrition associated diseases can help improve their nutritional state. As of yet, other complementary studies are still important for the broadening of the results.

Keywords: Complicated Malnutrition; Infections; Nutrition Based Management

Introduction

Malnutrition remains a serious health problem in the developing countries in spite of the variety of available agricultural products [1]. Malnutrition is accountable for about half of the deaths causes in children of less than five years of age in the world [2]. It strikes about one third of children below five years of age in Africa [3]. In the Democratic Republic of Congo, this situation imperils the life of more than 1,9 million infants or 8% of children under five years of age smitten by general acute malnutrition, 43% of those struck by chronic malnutrition, 23% of those affected by weight insufficiency according to the report given by EDS 2013-2014.

Malnutrition is raging in all the provinces of the Democratic Republic of Congo. Yet, there are discrepancies between provinces as concern figures.

In fact, the nutritional condition of children under five years of age is very worrying in the province of Eastern Kasai because of the epidemic of measles worsened by the move of populations. In this province, malnutrition reaches the peak rate of 16,1% for general acute malnutrition and 3,8% for severe acute malnutrition [4].

During the onset of malnutrition, the co-morbidity such as cerebral motor deficiencies, current infectious diseases, diarrhea, cough, congenital heart diseases, and anemia are serious factors putting at risk the life prognosis of malnourished children [5]. In most developing countries, these deaths concern more than 70% of children whose age is below five years [2].

The most associated infections in malnourished children are less reported about in the Democratic Republic of Congo. Therefore, the chief objective of the present work is to identify the associated diseases in order to facilitate a speedy and better management of malnourished children of 0 to 59 months of age.

Methodology and Material

This work is a prospective and descriptive study carried out in the Therapeutic and Nutritional Intensive Care Unit of the WIKONG General Referral Hospital which is based in the Health Zone of WIKONG in the Province of Lomami in the Democratic Republic of Congo. The study was focused on children aged between 0 and 59 months and ranged from 6th August 2019 to 31st March 2020 and included the whole of children who consulted and were admitted in the hospital during the eight months of our study in the WIKONG Therapeutic and Nutritional Intensive Care Unit for complicated and severe malnutrition.

It should be noted that we took into account all children whose age bracket was between 0 and 59 months and who were admitted in the WIKONG Therapeutic and Nutritional Intensive Care Unit for severe acute malnutrition and whose medical record was available and fully filled.

The socio-demographic (age, sex), clinical (infectious diagnosis) and biological data (HIV serology, tick drop, cyto-bacteriological analysis of the spinal cord fluid, lungs (x-ray) were collected from the whole of the children who were admitted in the hospital from the admittance to their leave. The definition of complicated, severe and acute malnutrition is given according to the criteria of the World Sanitary Organization, that is to say weight is contrasted with height: $< - 3$ z-scores and/or brachial perimeter < 115 mm and/or the presence of bilateral malnutrition related edema having one or more medical complications [6,7]. Gastro-enteritis was merely diagnosed on the basis of the presence of digestive functional signs like diarrhea and/or vomiting; malaria was confirmed just by a positive blood malarial test (tick drop); lower respiratory tract infections were taken as an entity grouping together bronchitis, bronchiolitis, pneumonia and broncho-pneumonia, depending upon the clinical symptoms or x-ray cliché enclosed in the patient's medical record; the upper respiratory tract infections clubbed together diseases like rhino-pharyngitis, tonsillitis and acute middle otitis as clinically diagnosed. Tuberculosis was defined by signs and symptoms associated to relevant x-ray abnormalities [8]. Sepsis or septicemia was defined by the combination of at least two criteria of the Systemic Inflammatory Response Syndrome (fever; hypothermia, polypnea or bradypnea, tachycardia, hyperleucocytosis or leucopenia) with a very well identified infectious site [9]. The skeptical choc was defined by the septicemia signs associated to one or several organ disorders (circulatory, respiratory, renal, hepatic, upper faculties' disorders and coagulation) and low blood pressure [9]. Due to the lack of early virological diagnosis test in our area, the HIV infection was considered either on the basis of a HIV positive serology after the age of 18 months or on the basis of suggestive clinical signs of the HIV infection according to the definition of the World Health Organization in the children born from HIV positive mothers. Urinary infection was defined by the combination of leucocyturia and significant bacteriuria.

Studied variables

The socio-demographic characteristics : age, sex, and the distance covered; the anthropometrical parameters at the admittance and the leaving of the hospital (acknowledgement act), weight,

brachial perimeter, and the weight clue in relation to the height (z-score) and the clinical characteristics (consultation reason, the presence and degree of edema caused by malnourishment, medical complications) were studied in the present study.

Statistical analyses

The collected data were encoded first on the table sheet of Excel Microsoft Software package and then imported for their processing with the Epi info™ 7.2.3.1 software package (CDC, 2019). Results have been presented in a form of tables and figures comprising the number of patients observed, proportions, sex ratio, averages and standard deviation (SD).

Results

Proportions of undernourished children in relation to sex

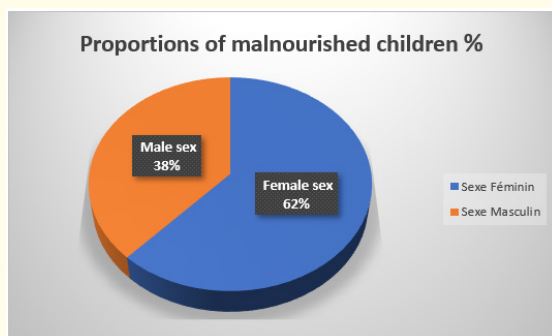


Figure 1: Diagramme of the breaking down of malnourished children according to sex.

We recorded a proportion of 62% of malnourished she-infants against 38% of malnourished he-infants, with a sex ratio of 1,6 girls/boys.

Proportion of malnourished children in accordance with age

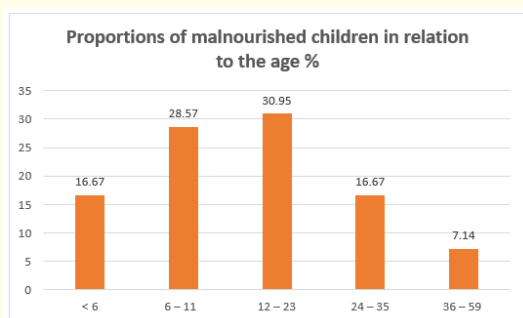


Figure 2: Diagramme of the distribution of malnourished children according to age.

The majority of malnourished children were aged between 6 and 23 months (59,52%). The average age was of $15,52 \pm 11,43$ months with extremities comprised between 3 weeks and 59 months.

The per cent of malnourished children in relation to age

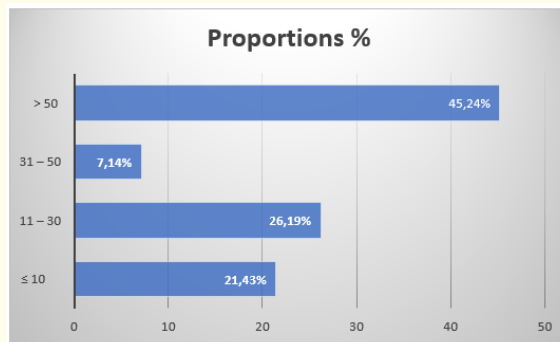


Figure 3: Diagramme of the breaking down of the covered distance in relation to the proportion of malnourished children.

Our study noted that 45,24% of mothers/accompanying persons would cover a distance of more than 50 Km before reaching the Health Center against only 21,43% who could cover less than 10km.

Distribution of malnourished children depending on edema

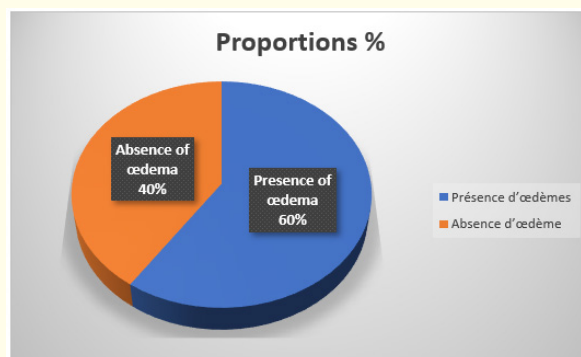


Figure 4: Diagramme of the structure of malnourished children in relation to edema.

It has been noted that 60% of malnourished children had edema.

Structure of malnourished children according to the reasons for consultation by children’s mothers or accompanying persons

(Table 1)

Reasons for consultation	N = 42	%
Cough	32	76,19
Anorexia	31	73,81
Fever	31	73,81
Diarrhoea	17	40,48
Hypoglycemia	15	35,71
Vomiting	10	23,81
Anemia	8	19,05
Hypothermia	3	7,14
Coma	2	4,76
Convulsions	2	4,76
Other reasons*	10	23,81

Table 1: Distribution table of malnutrition related reasons for consultation.

Other reasons for consultation: Low weight, mouth sores, bloody stools, hypothermia

The most frequent reasons for consultation were cough (76,19%), anorexia and fever (73,81%), diarrhea (40,48%) and hypoglycemia (35,71%).

Apportionment of pathologies which are associated to children malnutrition

Considered diagnosis	N = 42	%
Malaria (uncomplicated and complicated)	24	57,14
Persistent Enteritis	10	23,81
Mouth Candidosis	8	19,05
Urinary tract Infection	3	7,14
Accute respiratory Infection	3	7,14
Meningitis	3	7,14
Pneumonia	3	7,14
Septic Shock	1	2,38
Oropharyngial Infections	1	2,38
Tuberculosis	1	2,38
Measles	0	0
Sepsis	0	0
Tuberculosis - HIV	0	0
HIV	0	0
Other pathologies*	8	19,05

Table 2: Distribution table of pathologies associated to malnutrition.

Other pathologies: Intestinal parasitosis, dehydration, heart failure, dermatosis.

The most current medical complications encountered in malnourished children were malaria (57,14%), persistent enteritis (23,81%) and mouth candidiasis (19,05%).

Socio-demographic Features	Degree of edema		Total (N = 25)	RR	p-value
	++ (n = 10)	+++ (n = 15)			
Sex				0,84 [0,32 - 2,22]	0.000
Feminine	6 (24%)	10 (40%)	16 (64%)		
Masculine	4 (16%)	5 (20%)	9 (36%)		
Age (month)				0.025	
<6	0 (0%)	0 (0%)	0 (0%)		
6 - 11	(4%)	(8%)	3 (12%)		
12 - 23	8 (32%)	4 (16%)	12 (48%)		
24 - 59	1 (4%)	9 (36%)	10 (40%)		

Table 3: Distribution of socio-demographic features (age and sex) depending on the degree of edema.

The table here above is presenting the situation of children suffering from edema in relation to sex and age. It can be inferred from it that children of the female sex represented 64% of the whole lot of children affected by edema. 60% of children had 3rd degree edema. No child below 6 months suffered from edema.

Discussion

During the period of the study, 42 children suffering from serious acute malnutrition with different complications were admitted in the Nutritional and Therapeutic Intensive Care Unit of WIKONG. In this group, the female sex was the most affected by serious acute malnutrition with different complications. This can be justified by the registered proportion of cases. More than 60% of these malnourished children suffering from serious acute malnutrition with complications were of the female sex with a sex ratio of one boy for six girls. These results agree with those of the National Nutrition Program of the Democratic Republic of Congo which state or confirm that malnutrition is encountered much more in young girls than young boys in this country [7]. The same observation

was made by DEMBELÉ in 2004 in his study on the management of acute malnutrition at the Nutritional Rehabilitation and Education Center of Saint Camille Juvénat-filles in Ouagadougou, Burkina Faso. But our results are different from those of SONDE [10] which revealed that the male sex prevailed over the female (57,7%). This predominance of the serious acute malnutrition with its complications in girls would be in part due to their big physiological sensitivity to malnutrition [11].

Among the children affected by serious acute malnutrition with its complications, the age bracket between 6 and 23 months was the most affected and represented more than half of the sample, meaning 60%. This age bracket has been recognized by a many authors as a favorite age for the onset of malnutrition [7]. In fact, during this period of life of the new infants there is a diversification of diet. Malnutrition of new born at this age could be explained by the inappropriate diversification of diet often which are done precociously or lately or with inappropriate complement food or early ab lactating due to new a pregnancy [12,13]. It can also probably be caused by a bad practice of food and hygienic rules but also especially because of the poor health care services causing medical complications before every consultations.

Then, the symptoms that motivate parents to go to the doctor's for consultations 'sake in a Health Care Center before their admittance in a Therapeutic and Nutritional Care Unit were chiefly in the following decreasing order: cough (76,19%), anorexia or fever (73,81%), diarrhea (40,48%), hypoglycemia (35,71%), diarrhea alone or associated to other diseases. After having collected during consultation from parents or those accompanying them. The most medical complications considered in severely malnourished infants with complications in this study were malaria (57,14%), persistent enteritis (23,81%) and mouth candidiasis (19,05%). This noted information discrepancy between parents/accompanying persons and the considered diseases after consultation can be explained by the fact that the parents of the children centered on the visible malnutrition symptoms to make their observations [14]. The prevalence of malnutrition associated to complicated malaria could find its explanation in the fact that malaria is accountable for the immune system failure with the reduction of the appetite of the sick infants, making him vulnerable to infections and malnutrition. The strong proportion of children suffering from malaria in the selected sample confirms the argument of Richard *et al.* 2016 in their study on the infectious profile and the mortality of children whose age is below 5 years and were admitted for severe acute malnu-

trition. The Therapeutic and Nutritional Center of Bukavu, in the Democratic Republic of Congo, reported that one malnourished child had malaria at his admittance in the Therapeutic and Nutritional intensive care unit, in the Democratic Republic of Congo. Melle *et al.*, [15] in Burkina Faso notified that malaria was more frequent in malnourished children than in other ones who did not suffer from malnutrition and whose condition reached their worst level at the time of their weaning. So in their study, 18,4% of cases of malaria associated with severe acute malnutrition have been registered.

In this study, apart from ordinary complications, edema was also noticed in malnourished children with complication. Children suffering from edema were more than 59% in the Therapeutic and Nutritional Intensive Care Unit at the admittance whereas other authors like Ouédraogo [16] revealed a proportion de 25% but widely higher than that of Bitwé *et al.* [8] which notified a proportion of 12,5%. Yet, this per cent is nearer than that of Bachou *et al.* (2006) which reported a proportion of 50%. The noted differences are due to the fact that the Therapeutic and Nutritional Intensive Care Unit in this study only received children suffering from severely acute malnutrition with complications, this offering a much more likelihood of recruiting children with edema. In fact, all the rural Health Centers received malnourished children among whom all the complicated cases which directed to the WIKONG Therapeutic and Nutritional Intensive Care Unit. Among the children with edema, 60% of them were within an age bracket considered between 6 and 24 months and no child with edema whose age was below 6 months was registered. It can be the outcome of insufficient consumption of protein-enriched food for the children between 6 and 24 months and the protection by exclusive maternal breast-feeding for those under 6 months of age. It can also be the outcome of the insufficient consumption of protein-enriched food for those children aged between 6 and 24 months and the exclusive maternal breast-feeding for children whose age is below 6 months. Moreover, according to EDS 2013-2014 done in the Democratic Republic of Congo, 91% of children were unacceptably minimally fed. But nowadays 52% of infants are being breast-fed in the immediate hours following their birth and 48% of them are exclusively breast-fed.

The malnutrition related complications in those children may be explained by the distance covered by the parents before reaching the Health Care Center. The length of the distance to be covered by the parents with their sick children may be cause for their refusal to go to the doctor's as soon as possible and therefore occasion

the breakout of medical complications in these already fragile and fragilised children [15,17].

It has been revealed through this study that most of the parents with their sick children (45,24%) would cover on walking a distance of 50 Km before getting to the Health Center. The discrepancies in terms of infantile nutrition between the different rural communities are more significant in those areas than in urban communities [2,18]. It finally appears that the life standing based inequality between children could be one of the causes of malnutrition in this zone of study.

Though this study sample was so limited in a way that the whole of the country was not covered by the said study, but at least it has enhanced a potential which deserves to be exploited further. The use of the collected data on the malnutrition linked complications would offer interesting orientations for appropriate nutritional treatments definition in the developing countries. This study will equally be useful as concerns the sharing of knowledge between humanitarian actors and governments when it comes to the treatment of malnutrition with complications. In addition, it would serve the purpose of a database for decision taking concerning the complications linked to the management of the disease in developing countries, and above all to standardize the results of our research to the regional and global forums on internationally considered target [19-21].

Conclusion

This study has been initiated in order to assess the prevalence of diseases associated to the onset of infantile malnutrition in children of 0 to 59 months who are suffering from complicated severe acute malnutrition in the intensive care nutritional treatment centers.

Malnutrition was accentuated (59%) in children whose age bracket was between 6 and 23 months. The results of this study revealed a sex ratio of one boy versus six malnourished girls of 0 to 59 months. The majority of patients had malaria associated to malnutrition (57%), but the presence of edema was more accentuated in most patients of 6 to 23 months.

Yet, the context of this study and other factors which have not been clarified in the course of this study on the pathologies associated to infantile malnutrition in the WIKONG Nutritional and Therapeutic Intensive Care Unit in the Democratic Republic of Congo

could also have an influence on some results. Accordingly, complementary studies are most important in order to best appreciate associated pathologies to malnutrition in infants of 0 to 59 months of age in the Nutritional and Therapeutic Intensive Care Unit.

Bibliography

1. Institut international de recherche sur les politiques alimentaires (IFPRI). Rapport sur la nutrition mondiale: mesures et redevabilité en vue d'accélérer les progrès mondiaux en matière de nutrition et de développement durable. Washington, DC (2015).
2. UNICEF. Situation des enfants dans le monde. Green Communication Design Inc. (2012): 45-98.
3. International Food Policy Research Institute (IFPRI) Rapport sur la nutrition mondiale 2016: des promesses aux impacts: éliminer la malnutrition d'ici 2030. Washington, DC (2016).
4. Ministère de santé publique, Pronanut. "Protocole national de prise en charge de la malnutrition aiguë". RD Congo (2016): 226.
5. Richard MK., *et al.* "Profil infectieux et mortalité des enfants âgés de 0 à 5 ans admis pour malnutrition aiguë sévère: étude de cohorte rétrospective au Centre Nutritionnel et Thérapeutique de Bukavu, République Démocratique du Congo". *Pan African Medical Journal* 23 (2016): 139.
6. OMS UNICEF. "Stratégie mondiale pour l'alimentation du nourrisson et du jeune enfant". Organisation Mondiale de la Santé ed, Genève (2003): 15-29.
7. OMS. "Normes de croissance OMS et identification de la malnutrition aiguë sévère chez l'enfant". Organisation Mondiale de la Santé ed, Genève (2009): 2-3.
8. Bitwe R., *et al.* "Modèle pronostique simplifié d'évaluation de la mortalité intra hospitalière globale des enfants en Afrique centrale". *Tropical Medicine and International Health* 11 (2006): 73-80.
9. Black R., *et al.* "For the Maternal and Child Undernutrition Study Group. Maternal and child Undernutrition: global and regional exposures and health consequences". *Lancet* (2008): 243-260.

10. Sonde I. Analyse de la prise en charge d'enfants en malnutrition au centre de récupération nutritionnelle (CREN) de Tanghin (Burkina Faso). Mémoire de Master complémentaire en sante publique. Université de Liège (ULg) (2009): 39.
11. World Health Organization. Child Growth Standards based on length/height, weight and age. *Acta Pædiatrica*, Geneva (1651-2227) 450 (2006): 76-85.
12. Zoubga WA. Déterminants de la mortalité chez les enfants de 0 à 59 mois malnutris aigues sévères admis au Centre Hospitalier Universitaire Yalgado Ouédraogo (CHU-YO) Burkina Faso: Université de Ouagadougou; Mémoire de Maîtrise (2015).
13. Kouakou E., *et al.* 5th International Congress on Primary Healthcare & Family Medicine November 29-30. Madrid, Spain Introduction early food in infants: Source of malnutrition in developing countries (2017).
14. Bhutta ZA and Salam RA. "Global nutrition epidemiology and trends". *Annals of Nutrition and Metabolism* 61.1 (2012): 19-27.
15. Melle MC. "Facteurs favorisant la malnutrition infantile dans la région de Ouahigouya (Burkina Faso)". Faculté de Médecine de DIJON. Thèse de médecine (2006): 154.
16. Ouédraogo M. "Évaluation du rapport coût-efficacité de la prise en charge nutritionnelle au CREN du centre médical Saint Camille de Ouagadougou". Mémoire de maîtrise, Université de Ouagadougou (2012): 69.
17. Kouakou E., *et al.* "Procédé traditionnel de production d'aliments thérapeutiques pour la prise en charge nutritionnelle". *International Journal of Current Research* 8.9 (2016): 39395-39398.
18. Kabali H Eugénie. "Facteurs associés à la mortalité maternelle intra hospitalière et circonstances de décès chez des femmes avec complications obstétricales sévères à Kinshasa (RD Congo)" (2020).
19. Barry B. "Evaluation de la prise en charge de la malnutrition aigüe sévère dans le service de pédiatrie de l'hôpital de Gao". République du Mali: Université de Bamako; Thèse de Médecine (2009): 87.
20. Dembélé J. Prise en charge de la malnutrition aigüe au Burkina Faso: cas du centre de récupération et d'éducation nutritionnelle du CSPS Juvénat-filles de Saint Camille à Ouagadougou (2014): 55.
21. Organisation mondiale de la Santé. "Principes directeurs pour l'alimentation des enfants âgés de 6 à 24 mois qui ne sont pas allaités au sein". Genève (Suisse) (2006).

Assets from publication with us

- Prompt Acknowledgement after receiving the article
- Thorough Double blinded peer review
- Rapid Publication
- Issue of Publication Certificate
- High visibility of your Published work

Website: www.actascientific.com/

Submit Article: www.actascientific.com/submission.php

Email us: editor@actascientific.com

Contact us: +91 9182824667