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Meta-analysis

A meta-analysis of compliance with revised WHO-infant and young child feeding indicators in data generation

Gideon O. Iheme [a, *], Ogechi C. Nzeagwu [a], Chinwe A. Uzokwe [a], Silverline Matthew [b], Linda O. Edafioghor [c]

[a] Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture Umudike, Abia State, Nigeria
[b] Department of Clinical Services, Federal Neuro-Psychiatric Hospital, Calabar, Nigeria
[c] Department of Nutrition and Dietetics, Federal Medical Centre Asaba, Nigeria

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SUMMARY

Background & aims: A comprehensive set of validated core infant and young child feeding (IYCF) indicators replaced the previous guideline and created a consensus on breastfeeding and complementary feeding indicators. It remains unknown how local studies have adopted these originally absent complementary feeding indicators in their data generation. The study is aimed to evaluate the level/rate of adoption of core complementary feeding (CF) indicators in Nigeria.
Methods: Meta-analysis of literature on complementary feeding indicators utilized in Nigeria by peer-reviewed articles published from 2009-2019 was conducted. A bibliographic survey was carried out in several databases, review of abstracts and full texts followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines. Eligible peer-reviewed published studies were compared to the core CF indicators proposed by WHO in 2008. Data were analysed using SPSS version 25.
Results: A total of 33 articles met the inclusion criteria. Majority (72.7%) of the peer-reviewed published studies failed to adopt a single core CF. Trends in the mean utilization of CF indicators revealed that recent studies published in 2015, 2016, 2017 and 2019 reported a mean utilization score of 0.4, 0.75, 1.33 and 1.50 out of an available 5 indicators respectively. A significant positive correlation between publication year and the number of indicators adopted ($r = 0.48$; $p = 0.004$) was observed. In comparison with standards, CF indicators such as the introduction of semi-solid foods and minimum meal frequency indicators though mentioned were inappropriately utilized by 75.8% and 36.4% of the reviewed studies as the required age and/or breastfeeding status were not considered.
Conclusion: Slow but significant adoption of CF indicators overtime was reported in this study. Hence, there is need to ensure quick adoption of standard indicators/guidelines by local studies as this will promote the generation of pooled evidence.
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1. Introduction

The first 2 years of life known as the “window of opportunity” are the most critical for the development of children because nutritional deprivation during this period may likely result in largely irreversible physical/cognitive deficits. About half of all childhood deaths have been associated with under-nutrition [1]. It has been further estimated that if breastfeeding and complementary feeding were practised as recommended, up to 19% or 220, 000 of under-5 deaths would be averted each year [2]. This makes optimal infant and young child feeding (IYCF) practice pivotal towards ensuring not only child survival but child growth and development as well.

Increased data availability in the field of nutrition has led to a plethora of metrics and indicators being developed for different levels of research evaluation in line with expert recommendations. The lack of clear international recommendations for some aspects of IYCF has halted the development of universal indicators to

Abbreviations: WHO, World Health Organization; IYCF, Infant and Young Child Feeding; CF, Complementary feeding.

* Corresponding author. Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture Umudike, P.M.B. 7267 Umuahia Abia State, Nigeria.
E-mail address: ihemegideon@gmail.com (G.O. Iheme).

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define optimal feeding [3]. WHO-IYCF indicators [4], which was proposed about 3 decades ago elaborately considered breast-feeding indicators with less focus on complementary feeding practices. A comprehensive set of validated core and optional IYCF indicators including appropriate complementary feeding was published in the last decade [5]. The new standard has replaced the previous guideline [4] and created a consensus on IYCF indicators and provided methodological standardization for their measurement [5].

These revised indicators have been widely generated by localized and national population-based surveys since the development of this guideline [6]. Evidence showed that the Nigerian Demographic and Health Survey has adopted the core and few optional IYCF indicators in their recent 2013 and 2018 reports [7, 8]. Although appropriate complementary feeding practices are critical, large-scale action to improve behaviours has been held back by the limited knowledge of the degree of adherence to the WHO-IYCF indicators amongst local studies, as pooled evidence from individual studies will expose critical cross-cutting gaps in IYCF practices in Nigeria.

Therefore, this study seeks to explore how well local studies conducted in Nigeria have adopted the WHO proposed set of core complementary feeding indicators.

2. Methods

Review of abstracts and full texts followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines as shown in Fig. 1. A bibliographic survey was carried out in these databases; Google scholar, Medline (PubMed), and African Journals Online (AJOL). The descriptors used in English were Infant and young child feeding practices, Complementary feeding practices, 6–23 months, Nigeria combined with Boolean "OR" and "AND" operators.

All titles/abstracts identified in the electronics databases were screened by two reviewers independently. Results were restricted to peer-reviewed original articles published in English between 2009 and 2019. Studies were included if: the study was conducted in Nigeria, consist of non-HIV/AIDS infected babies and children aged 6–23 months were involved.

The following five core complementary feeding indicators were proposed by WHO [5] for infants and young children aged 6–23 months;

Introduction of solid, semi-solid or soft foods:-Proportion of infants 6–8 months of age who receive solid, semi-solid or soft foods.

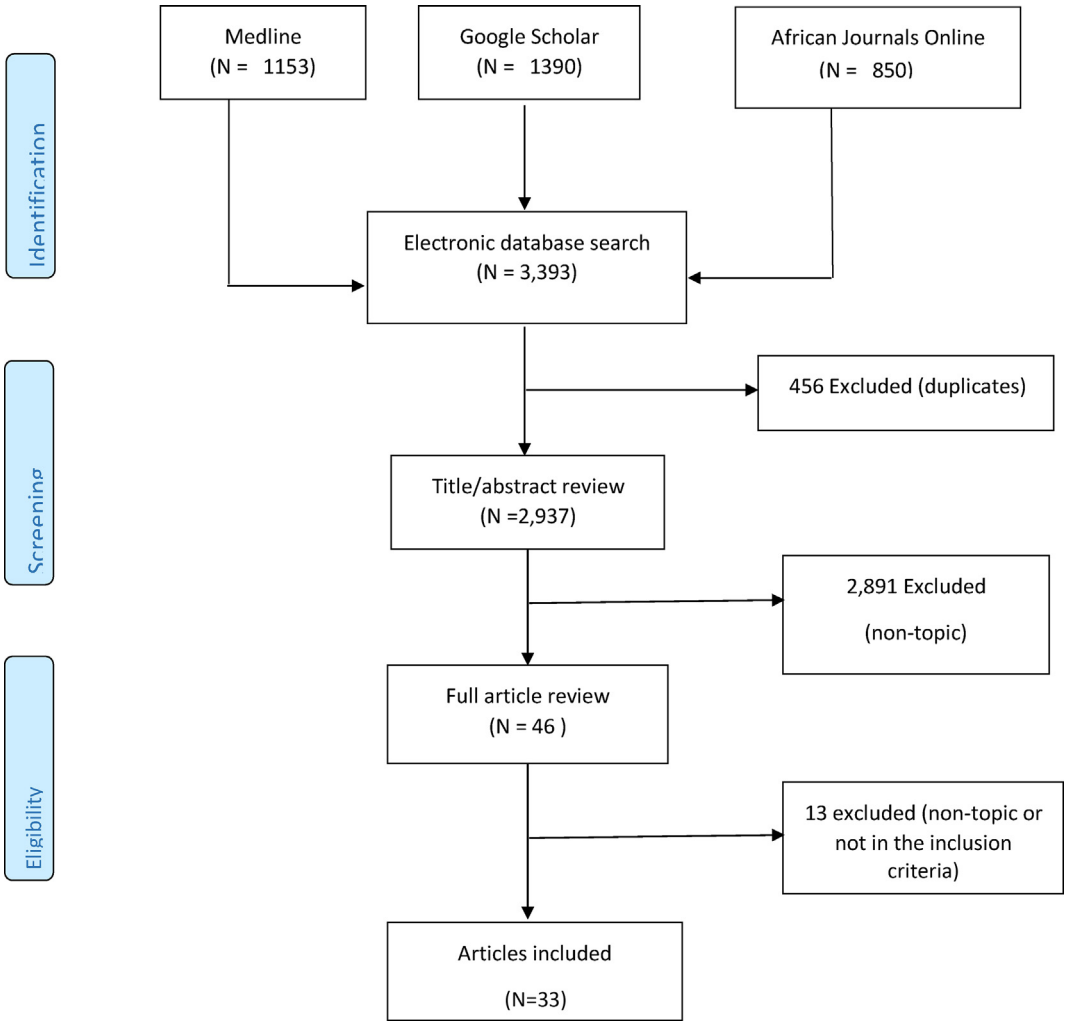


Fig 1. Flow chart of article selection based on PRISMA recommendations

Minimum dietary diversity (MDD):- Proportion of children 6–23 months of age who receive foods from 4 or more food groups. The seven food groups include; a) Grain, roots and tubers b) Legumes and nuts c) Diary products d) Fleshy foods e) eggs f) Vitamin A rich fruits and vegetables g) Other fruits and vegetables.

Minimum meal frequency (MMF):- Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods (but also including milk feeds for non-breastfed children) the minimum number of times or more. Minimum; 2 times for breastfed infants 6–8 months, 3 times for breastfed infants 9–23 months and 4 times for non-breastfed infants 6–23 months.

Minimum adequate diet (MAD):-The child aged 6–23 months received a meal that meets standard for dietary diversity and meal frequency.

Consumption of iron-rich/iron-fortified foods (6–23 months):- Proportion of children 6–23 months of age who receive an iron-rich food or iron-fortified food that is specially designed for infants and young children, or that is fortified in the home.

Furthermore, this study employed descriptive statistics to reveal the frequency and percentage of core complementary feeding indicators and mean core CF utilization score per year of publication. This is based on an available five core complementary feeding indicators. Pearson correlation was used to determine the relationship between publication year and application of core complementary feeding indicators in data generation. All analysis was done using SPSS Version 25.

3. Results

The electronic database search retrieved a total of 3,393 articles. The titles and abstracts were screened and it was observed that most of the articles (3347, 98.6%) were not relevant to this study. 46 articles were reviewed in full and a total of 33 articles met the inclusion criteria (see Table 1).

Results from Table 2 shows that majority- 25 out of 33 (75.8%) of the selected peer-reviewed published studies failed to appropriately apply any of the core complementary feeding indicators in their data generation. Only a small fraction of these studies utilized one (9.1%) or three (15.2%) out of the five core complementary feeding indicators.

Figure 2 shows the trends and association between the mean adoption of complementary feeding indicators by local researchers and the year of publication. Reports showed a zero out of an available 5 indicators adopted from peer-reviewed studies published in 2009–2015. Recent studies in 2015, 2016, 2017 and 2019 reported a mean adoption/utilization score of 0.4, 0.75, 1.33 and 1.50 respectively.

Furthermore, publication year was positively correlated with the number of indicators adopted ($r = 0.48$; $p = 0.004$) in Fig. 2. This implies that as publication year increases, number of indicators adopted by researchers will increase as well.

Table 3 shows the level of application of individual core IYCF indicators. Introduction of semi-solid foods and meal frequency indicators were inappropriately applied by 75.8% and 36.4% of the reviewed studies.

4. Discussion

Study reports that majority (72.7%) of the studies failed to adopt a single core complementary feeding indicator coupled with the observed slow adoption rate of these indicators over the years agrees with assertions by Hajeebhoy et al. [42] that core complementary feeding indicators do not enjoy the same degree of understanding and visibility of breastfeeding indicators which are well understood and effectively utilized.

Inappropriate use of some complementary feeding indicators (such as the introduction of semi-solid foods and minimum meal frequency) were reported in this study. Constant revision of surveillance/assessment tools is the first step towards accurate application of the WHO-IYCF indicators [42]. Detailed revision will enable national nutrition stakeholders to review and adapt these guidelines to suit local contexts and capture local infant food sources, types and categories. After which, effective knowledge transmission through capacity development of all nutrition stakeholders to garner consensus, appreciation and acceptance of the new indicators as accurate performance measures is critical to ensuring appropriate utilization of IYCF indicators in local data generation.

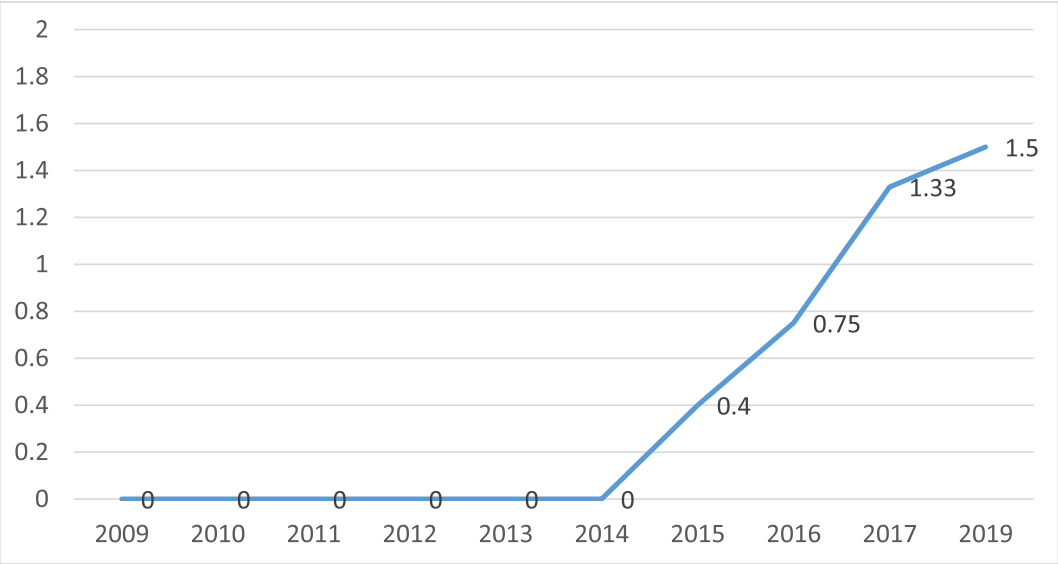
The significant ($p < 0.05$) association between the number of indicators utilized and the year of publication is an indication that local researchers take time to acclimatize and adopt standard guidelines/recommendations. This contradicts the reported rapid and total adoption of core IYCF indicators in Nigerian Demographic

Table 1
Characteristics of reviewed studies.

S/NO	References	Sample size	Age range
1	Tagbo and Uhasoro [9]	332	0–12 months
2	Matthew et al., [10]	255	0–24 months
3	Imonikebe, [11]	300	0–12 months
4	Oganah, [12]	200	0–23 months
5	Awogbenja and Ugwuona, [13]	800	6–59 months
6	Ajao et al. [14]	423	Under-5
7	Ene-Obong et al. [15]	200	0–23 months
8	Okwori et al. [16]	100	0–12 months
9	Bolajoko et al. [17]	200	0–24 months
10	Umar and Oche, [18]	143	0–12 months
11	Olatona et al., [19]	358	6–23 months
12	Anoshirike et al. [20]	410	0–12 months
13	Ndiokwelu et al. [21]	200	0–24 months
14	Lawan et al., [22]	110	0–12 months
15	Akeredolu et al., [23]	300	0–23 months
16	Akpan et al., [24]	522	6–11 months
17	Ogunba, [25]	450	0–23 months
18	Agbedeyi et al. [26]	1541	0–35 months
19	Ayogu et al. [27]	240	0–23 months
20	Okereke et al. [28]	100	0–12 months
21	Oladoyinbo et al. [29]	350	0–23 month
22	Robert et al. [30]	200	6–60 months
23	Udoh and Amodu [31].	330	6–11 months
24	Sanusi et al. [32]	419	0–24 months
25	Olatona et al. [33]	355	6–23 months
26	Okafoagu et al. [34]	296	6–24 months
27	Ibe et al. [35]	340	0–24 months
28	Omotoye and Adesanmi [36]	540	0–24 months
29	Atimati and Adam, [37]	418	0–24 months
30	Sosanya et al. [38]	720	Under 5
31	Ibrahim et al. [39]	440	0–12 months
32	Tobi et al. [40]	307	0–24 months
33	Akpor et al. [41]	200	0–59 months

Table 2
Utilization frequency of complementary feeding core indicators.

Number of indicators met	Frequency	Percentage
None	25	75.8
One	3	9.1
Two	0	0.0
Three	5	15.2
Total	33	100.0
Overall mean utilization of CF indicators = 0.61 ± 1.17		



r = 0.48**
p = 0.004
(** = correlation is significant at the 0.01 level)
Year 2018 missing due to lack of evidence – no selected study was published in 2018.

Fig 2. Association between year of publication and mean utilization of complementary feeding indicators (2009-2019).

Table 3
Adoption of individual core IYCF indicators.

	Appropriate		Inappropriate		Unavailable	
	Frequency	%	Frequency	%	Frequency	%
Introduction of semi-solid foods (6–8 months)	3	9.1	27	81.8	3	9.1
Minimum Dietary diversity	5	15.2	1	3.0	27	81.8
Minimum Meal Frequency	5	15.2	12	36.4	16	48.5
Minimum Adequate Diet	5	15.2	0	0.0	28	84.8
Consumption of Iron rich foods or iron fortified foods/supplements	0	0.0	0	0.0	33	100.0

Appropriate = Indicators generated in accordance to specified guidelines/recommendation.
Inappropriate = Similar to core IYCF indicators but specific recommended age or categories not considered.
Unavailable = IYCF core indicators not generated at all.

and Health Surveys of 2013 and 2018 [7, 8]. As has been the experience with the worldwide adoption of the WHO Child Growth Standards [43], efforts to achieve widespread adoption of the WHO-IYCF indicators in global, national and local studies will enable the development of a global evidence base for IYCF practices across countries and time.

5. Conclusion

Findings from this study have shown that majority of the selected peer-reviewed studies did not adopt or inappropriately applied the internationally recommended core complementary feeding indicators. A slow but significant ($p < 0.05$) adoption of these core CF indicators over the years was observed. Hence it is necessary to conduct capacity development training for local researchers to enhance the immediate visibility, comprehensibility and adoption of standardized indicators and guidelines.

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Authorship

G.O.I, O.C.N and C.A.U were responsible for the formulation of research concept and design. C.A.U and L.O.E contributed to the acquisition and screening of data. G.O.I and S.M were responsible for the statistical analysis. G.O.I and C.A.U drafted the manuscript while O.C.N and L.O.E critically reviewed the manuscript.

Availability of data and materials

The dataset that support the results and findings of this research are available from the author, upon reasonable request.

Declaration of competing interest

The authors have no conflict of interest to declare.

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