



The Determinants of Child Survival in South-west Nigeria

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Authors' contributions

This study was collaboration between both authors. Author BBO designed the study, handled technical details, supervised data collection, and wrote the protocol and the manuscript. Author ATO reviewed the design and protocol of the study and provided technical oversight. Both authors read and approved the final manuscript.

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ABSTRACT

Introduction: Child survival is an essential component of public health concerned with reducing child morbidity and mortality. Despite the gains attained during the Millennium Development Goals era, globally 14,000 children less than five years of age still die daily. Therefore, this study sought to evaluate the determinants of child survival in South-west Nigeria.

Methods: A four-stage random sampling technique was used to sample 1308 mothers of under-five children in southwest Nigeria. Information on demographic and socio-economic characteristics, child-related, maternal, paternal, and environmental factors were collected using a pre-tested, interviewer-administered semi-structured questionnaire. Data were analysed using SPSS version 20, descriptive statistics, and logistic regression was performed at a 5% level of significance.

Results: Mean age of respondents was 30.7±6.1years. Factors that significantly ($p<0.05$) influenced the survival of the under-five children were; mothers' literacy level, residence, low parity, mothers' educational qualification, type of flooring materials, and mothers' age at first birth. The odds of child survival is twice as higher in literate than non-literate mothers (OR:1.9; CI:1.2-2.8),

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urban than rural dwellers (OR:2.2; CI:1.1-4.8), mothers with at least a secondary education than uneducated (OR:2.1; CI:1.3-3.5), type of flooring materials (OR:4.3; CI:2.3-8.2) and respondents age at first birth (OR:1.1; CI:1.0-1.1). Also, women with low parity had less likelihood of under-five death than mothers with higher parity (OR:0.5; CI:0.3-0.9).

Conclusion: The study identified literacy level, residence, low parity, mothers' educational qualification, and type of flooring materials as determinants of child survival in southwest Nigeria. Therefore, all stakeholders should develop a more effective response to these determinants to ensure sustainable, realistic, and practical measures that will increase the survival of under-five children in the area.

Keywords: Under-five; mothers; child survival; children.

1. INTRODUCTION

“Substantial progress in improving child survival has been made worldwide in the past 25 years. Globally, the under-five mortality rate had dropped by 60%, from 93 in 1990 to 37 deaths per 1,000 live births in 2020. Over the same period, the annual number of under-five deaths dropped from 12.6 million to 5.0 million and 1 in 11 children died before reaching age 5 in 1990, compared to 1 in 27 in 2020” [1-4]. Despite the gains attained during this period, 14,000 children under the age of 5-years still die every day; this remaining burden of child mortality is not evenly distributed among or within countries [1]. About 49% of all under-five child deaths occur in only five countries of the world, namely, India, Nigeria, the Democratic Republic of the Congo, Pakistan, and Ethiopia with Nigeria contributing nearly 0.9 million of these deaths thus the highest contributor to under-five mortality in the world [1,5]. Unfortunately, many of the under-five children died from preventable or treatable diseases.

“With an under-five mortality rate of 74 deaths per 1,000 live births, 14 times higher than the risk for under-five children in Europe and Northern America, children born in sub-Saharan Africa continued to face the steepest odds of survival in the world. According to the United Nations report, some African countries fare better than Nigeria. For instance, Libya had 11 deaths per 1000 live births, and Seychelles had 14 deaths per 1000 live births, among West African countries Senegal and Ghana fared better than Nigeria with under-five mortality rates of 38/1,000 and 45/1,000 live births, respectively” [4,5].

“One in every 15 Nigerian children dies before reaching age one, and more than one in every eight does not survive to his or her fifth birthday” (NDHS, 2013; 2018). “Most of these deaths or conditions leading to death in children are

preventable or treatable largely through proven, cost-effective preventive interventions and early care at household, community, and primary health care levels such as promotion of adequate nutrition and weight gain during pregnancy, antenatal care, skilled health workers assisting at birth, access to emergency services and after delivery care for both mother and newborn, promotion of breastfeeding, infant and young child caring and feeding practices, hygiene, sanitation, case management of common illnesses at the home and community management of acute malnutrition” [6,7].

The Nigeria Demographic and Health Survey [7] revealed that under-five mortality declines with increasing mother's education and household wealth from 170 and 173 deaths per 1,000 live births among children whose mother has no education and is from the lowest wealth quintile to 56 and 53 deaths per 1,000 live births among children whose mothers have more than secondary education and from the highest wealth quintile respectively. Furthermore, demographic characteristics of mothers and children such as sex of the child, place of residence, mother's age at birth, birth order, previous birth interval, and infant's size at birth were found to play an important role in the survival of children less than five years of age in Nigeria [7].

Recent data indicated the Under-five mortality rate in Nigeria as 114 deaths per 1,000 live births in 2020, as against 210 per 1000 live birth in 1990 [2]. Even though there has been a gradual decline in Under-five Mortality in the country, the low rate of decline and the possible effect of COVID-19 on current progress made in improving child survival is a major cause of concern. Hence, the need to improve on the current progress to enhance the achievement of the child survival goals and prevent a possible reversal of progress in child survival via universal access to effective, high-quality, and affordable

care and the continued safe provision of life-saving interventions for women, children, and young people will be required.

“Even as evidence began to emerge in 2020 showing COVID-19’s very modest direct impact on child and young people’s mortality, numerous governments, organizations, and scientific institutions is concerned with the possible increase in indirect deaths among children and youth due to disruption of specific interventions and services that have proven to be critical in saving children and women’s lives in low- and middle-income countries” [2,8]. The early scenario-based modeling warned that increases in wasting coupled with a severe and sustained reduction in the coverage of basic life-saving interventions – antenatal care, childbirth delivery care, postnatal care, vaccinations, and early childhood preventative and curative services – could substantially increase under-five deaths, essentially reversing a decades-long decline in global under-five mortality [2,8]. Therefore, Access to basic lifesaving interventions such as childbirth delivery care, postnatal care vaccinations, and early childhood preventative and curative services to address these causes is critical WHO, 2018; [9].

Child survival is an essential component of public health concerned with reducing child morbidity and mortality [10]. It was developed by WHO, UNICEF, and World Bank in 2006 to address the issue of the high mortality rate of under-five children in the African region [10]. Child survival is the concentrated efforts by governments, the United Nations, organizations, and communities to use effective, low-cost solutions to protect children from illnesses during their first five years of life [11,12]. The steps that are taken to ensure the survival of under-five children are known as child survival strategies. Child survival strategies is defined as steps taken by individuals and communities to reduce the risk, duration, or severity of an adverse health condition that detrimentally affects the survival of infants and children less than five years of age [13].

“These include breastfeeding, immunization, oral rehydration therapy, zinc supplementation to treat diarrhoea, basic immunizations for common ailments, micronutrient supplementation to treat malnutrition, growth monitoring, and promotion, female education, family planning, and food fortification” [10,14]. Many countries are now devoted to child survival interventions as a way of reducing child mortality. Child mortality, also

known as under-five mortality or child death, refers to the probability of a child dying between birth and exactly 5 years of age. It is the death of infants and children under the age of five years and a core indicator for child health and well-being [1,15,16]. Infant and under-five mortality is an important indicator of the country’s socio-economic development and quality of life [7].

Since infant mortality is extremely high in some parts of the world, the priority in promoting effective child development is to ensure that children survive the early years when they are most vulnerable to disease and malnutrition. This research work is based on the analytical framework of child survival for developing countries by Mosley and Chen [17], which incorporate both social and biological variables, in providing the measure of morbidity and mortality in a single variable. The framework is based on the premise that all social and economic determinants of child mortality necessarily operate through a common set of biological mechanisms, or proximate determinants, to exert an impact on mortality, thereby advancing research on social policy and medical interventions to improve child survival [17].

The death of under-five children is an important indicator that defines the well-being of a population which is usually taken as one of the development indicators of health and socioeconomic status that indicate the quality of life of a given population, as measured by life expectancy. It is very important for evaluation and public health strategy [18]. The knowledge of variables that significantly influence child survival in society will provide valuable practical leads for combating the low pace in the reduction of under-five mortality witnessed in the nation and also maximize the use of available lifesaving interventions. It is against this background that this study was conducted to evaluate factors influencing the survival of under-five children in South-west Nigeria.

2. METHODOLOGY

Study areas: The study was conducted in south-western Nigeria which comprises six states, subdivided into local government areas (LGAs), and further divided into localities or administrative units. For this study, a community was defined as a cluster of six or more administrative units within the same LGA.

Study design: A population baseline survey using a systematic random sampling technique

Sampling size determination: The sample size for the study was determined using the Kasiulevicius et al. [19] method. Using this sample size formula, the sample size was calculated as:

$$N = \frac{(Za/2)^2 P(1-P)}{e^2}$$

$Za/2$ = standard normal deviation corresponding to 95% confidence interval set at 1.96.

e = level of error tolerance set at 5% (effect 0.05)

Using the under-five mortality rate of 62 deaths per 1000 live births in south-west Nigeria [7] yielded a sample size of 89.5, therefore to increase the sample size for the study, P is assumed to be 50%

P = Assumed proportion taken as 50%

N = Minimum required sample size is therefore calculated as:

$$N = \frac{(1.96)^2 (0.5) (1-0.50)}{0.05^2} = 384.16$$

=384 under-five children.

Adjusting the sample size for 10% non – response (NR)

$$\begin{aligned} \text{Adjusted sample} &= \frac{n}{1-NR} \\ &= \frac{384}{1-10\%} \\ &= \frac{384}{0.9} = 427 \end{aligned}$$

The total sample size was calculated as

$$N = 3 * 427 = 1281$$

A total of 1308 mother-child (under-five children) peer was sampled for the baseline survey.

Sampling procedure: it was conducted in a four-stage sampling technique: South-west Nigeria was divided into 3 clusters based on the under-five mortality rate for south-western states using data from NDHS 2018. The Local Government Areas (LGAs) in each of the cluster was drawn and stratified into urban and rural areas based on the World Bank classification for rural and urban settlements in Nigeria, 6 rural and 6 urban communities/areas were selected from each cluster, using a simple random sampling technique. A total of 1308 households were selected from the 36 sampled communities

by a systematic random sampling technique. A Household was sampled after every n^{th} (sampling interval) household calculated by dividing the total number of households in the community by the sample size for the community. The eligible respondent (mothers that currently have an under-five child) from the households were sampled. In the case where the sampled household did not have an eligible respondent, the next house was sampled.

Data collection procedure: A pre-tested interviewer-administered semi-structured questionnaire adapted from the literature review of other studies, WHO generic, NDHS 2013, and NDHS 2018 was used to collect information on demographic and socio-economic characteristics, child-related, maternal, paternal, and environmental factors. Research assistants were recruited and trained on the data collection process. These research assistants were directly supervised by the principal investigators.

Data analysis: Data collected was sorted, cleaned, and coded before being computed for analysis. Data were analysed using SPSS version 20, descriptive statistics, and logistic regression was performed at a 5% level of significance. The determinants of child survival were analysed using logistic regression. The logistic regression was used to estimate the odds of a child dying before reaching five years of age, thus investigating the significant determinants of under-five mortality in the study. The dependent variables were binary, for which the outcome variable is child survival status (alive or dead).

Under-five mortality (probability that under-five children die before celebrating their fifth birthday) rate in this study was derived from data on births and deaths occurring under the age of five years in the previous five years before the study. The information was collected as part of a retrospective birth history in which respondents listed all of the children to whom they had given birth, along with each child's date of birth, sex, survivorship status, and current age or age at death. This information was used to directly estimate the under-five mortality rate defined as the probability of dying between birth and the fifth birthday. The rate was expressed per 1,000 live births [6,7].

Under-five mortality estimated based on retrospective birth histories may be subject to possible reporting errors that can adversely affect the quality of the data. These may result

from the completeness with which births and deaths are reported and recorded, as well as the accuracy of information obtained on the current age and age at death for children who died. As a mechanism to enhance the quality of the data, mothers in the study were required to provide either health facility cards/certificates/or any other means of verifying the information provided on the birth or death been recorded.

3. RESULTS AND DISCUSSION

The mean age of the respondents was 30.7±6.1years. Most (94.9%) of the respondents in the study were married and the mean age of

respondents at first birth and mean number of children (parity) in the study were 24.6±4.29 and 2.4±1.4 respectively. Higher proportions of the respondents were literate and had at least a secondary education (78.0% and 78.4% respectively). The majority (91.4%) of the respondents had at least one form of employment.

The under-five mortality rate in this study was 52 deaths per 1000 live births; the rural settlement had the highest mortality rate of 53.6 deaths per 1000 live birth compared to the urban settlement with 49.1 deaths per 1000 live births.

Table 1. Demographic characteristics of respondents

Character		Residence		
		Urban	Rural	Total
Age of respondents (years)	≤19	7 (0.7)	5 (1.6)	12 (0.9)
	20-29	422 (42.2)	160 (52.1)	582 (44.5)
	30-39	475 (47.4)	113 (36.8)	588 (45.0)
	≥ 40	97 (9.7)	29 (9.5)	126 (9.6)
	Mean, Std. Deviation	30.9±5.9	30.2±6.8	30.70±6.14
	P<0.05	0.006		
Marital status	Single	30 (3.0)	18 (5.9)	48 (3.7)
	Married	956 (95.5)	285 (92.8)	1241 (94.9)
	Divorced/ Widowed	15 (1.5)	4 (1.3)	19 (1.4)
	P<0.05	0.064		
Age of respondents at first birth	18 and less	49 (4.9)	27 (8.8)	76 (5.8)
	> 18	952 (95.1)	280 (91.2)	1232 (94.2)
	Mean, Std. Deviation	24.76 ±4.20	23.89±4.51	24.56±4.29
	P<0.05	0.010		
Literacy level	Not literate	197 (19.7)	85 (27.7)	282 (21.6)
	literate	804 (80.3)	222 (72.3)	1026 (78.4)
	P<0.05	0.002		
Educational qualification (respondent)	Not educated	25 (2.5)	21 (6.9)	46 (3.5)
	Primary Edu	174 (17.4)	67 (21.9)	241 (18.5)
	Secondary Edu	801 (80.1)	218 (71.2)	1019 (78.0)
	P<0.05	0.000		
Educational qualification (Spouse)	Not educated	70 (7.0)	42 (13.7)	112 (8.6)
	Primary Edu	218 (21.8)	73 (23.9)	291 (22.3)
	Secondary Edu	712 (71.2)	191 (62.4)	903 (69.1)
	P<0.05	0.000		
Parity (number of children per mother)	1-2 children (Ref)	623 (62.2)	183 (59.6)	806 (61.6)
	3-4 children	304 (30.4)	86 (28.0)	390 (29.8)
	>4 children	74 (7.4)	38 (12.4)	112 (8.6)
	Mean, Std Deviation	2.37±1.36	2.47±1.48	2.39±1.39
	P<0.05	0.009		
Any form of employment (respondents)	Unemployed	56(5.6)	57 (18.6)	113 (8.6)
	Employed	945 (94.4)	250 (81.4)	1195 (91.4)
	P<0.05	0.000		
Main material for flooring	Natural floor	61 (6.1)	14 (4.6)	1209 (92.4)
	Finished floor	940 (93.9)	293 (95.4)	99 (7.6)
	P<0.05	0.193		
Total	Number (total)	1001 (76.5)	1308(100)	1308 (100)

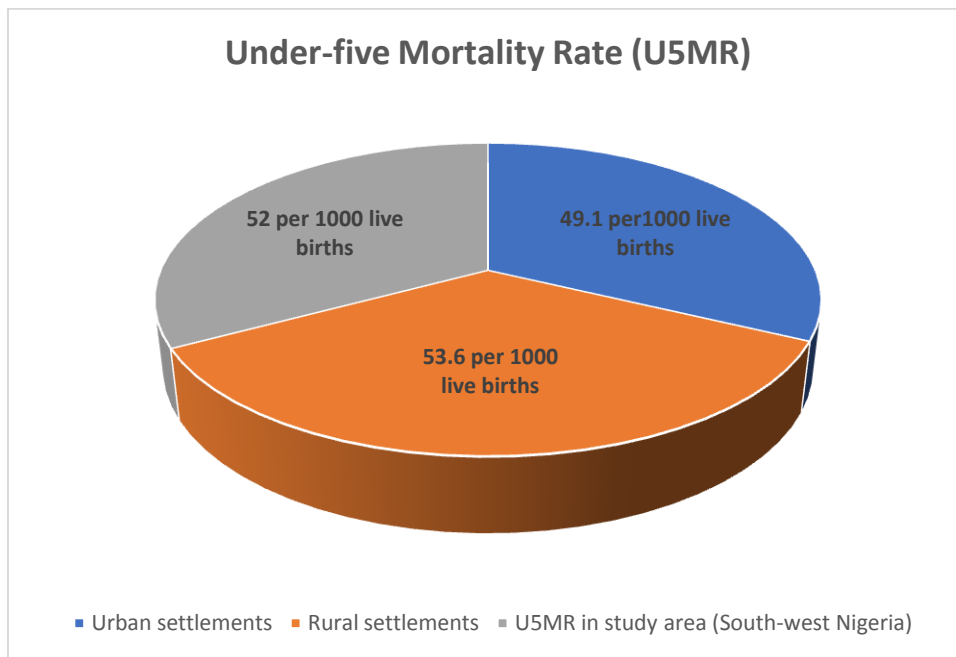


Fig. 1. Factors influencing the survival of under-five children in the selected LGAs

Logistic regressions were performed to ascertain the factors influencing the survival of under-five children in South-west Nigeria. The factors that were significantly ($p < 0.05$) associated with the likelihood of increasing the survival of the under-five children studied were mothers' level of literacy, place of residence, number of children per mother (parity), educational qualification of mothers, living in a house with finished floor, and mothers age at first birth.

The odd of children from literate mothers surviving is 1.85 (OR: 1.9; CI: 1.2-2.8) times higher than children from non-literate mothers. For the place of residence, the odd of children surviving is 2.24 (OR: 2.2; CI: 1.1-4.8) times higher in urban than rural settlements. For parity, it is an inverse relationship indicating that the likelihood of a child surviving is greater among mothers with fewer (low parity) numbers of children. Children of mothers with at least a secondary education are more likely (2.1 times (CI: 1.3-3.3)) to survive than children from uneducated mothers. Households with Finished/polished floors are 4.30 (OR: 4.3; CI: 2.3-8.2) times more likely to survive than those from households with natural floors. Mothers' age at first birth is also a significant factor that increases the likelihood of child survival in the study.

Information on the demographic and socioeconomic characteristics of respondents is

useful for understanding the factors that influence the health and wellbeing of the households. A large proportion of mothers in the study were between 20 to 39 years of age and are married. This age range corresponds to the most active age for childbearing in Nigeria. The result is similar to the report of NDHS 2018. It was also seen that majority of the respondents are literate (mothers who can read the whole or part of a typed sentence aloud with or without formal education) and had at least a secondary education and were currently employed. A similar trend of a large proportion of respondents having completed secondary education was literate and was currently employed in southwest Nigeria was reported in NDHS (2013 and NDHS 2018). The mean age of respondents (24.56 ± 4.29 years) at first birth in this study was slightly higher than the NDHS 2018 report of 23.4 years in southwest Nigeria.

The majority of the participants (94.3%) lived in houses with good healthy flooring materials (cement, ceramic tiles, carpet, and so on). Likewise, NDHS [6,7] reported that the majority of both urban and rural households in Nigeria use cement flooring in their dwellings. The trend observed in the household characteristics of respondents in this study is in agreement with NDHS 2013, 2018 report that the living conditions across the nation were mixed.

Table 2. Factors influencing the survival of under-five children in the selected states

Factors	Categories	Mortality		Sig.	Odd ratio (Exp. B)	95% C.I.	
		yes	no			Lower	Upper
Literacy level Mothers	Unable to read	40 (32.3)	242 (20.4)	.003	1.854	1.240	2.771
	Mother's ability to read	84 (67.7)	942 (79.6%)				
Residence	Rural	36(29.0)	271 (22.9)	.036	2.240	1.053	4.765
	Urban	88(71.0)	913(77.1)				
Parity	1-2 children (Ref)	60 (48.4)	746 (63.0)	.006	1.000		
	3-4 children	48(38.7)	342 (28.9)	.016	.483	.267	.871
	>4 children	16 (12.9)	96 (8.1)	.580	.842	.458	1.549
Educational qualification of mother	not educated (Ref)	5 (4.0)	41(3.4)	.005	1.000		
	Primary	36(29.0)	206(17.4)	.437	1.480	.551	3.978
	At least secondary	83(67.0)	937(79.1)	.001	2.120	1.342	3.348
Educational qualification of father	not educated (Ref)	10(8.1)	103(87.0)	.971	1.000		
	Primary	30(24.2)	261(22.0)	.810	1.142	.387	3.374
	At least secondary	84(67.7)	820(69.3)	.945	1.023	.536	1.952
The main material of the floor)	Natural floors	19(15.3)	56(47.3)		1.000		
	Finished/polished floors	105(84.7)	1128(95.3)	.000	4.303	2.269	8.159
Mother age at first birth	≤18 years	10(8.1)	66(5.6)				
	age at first birth >18 years	114(91.9)	1118(94.4)	0.007	1.071	1.019	1.125
Employment status of the mother	Not employed	17(13.7)	96(8.1)		1.000		
	Employed	107(86.3)	1144(96.6)	.111	1.735	.882	3.412

Note: Ref = reference

Under-5 mortality in the study was 52 deaths per 1000 live births (Fig. 1) for the five years preceding the survey. This is lower than the report of 62 deaths per 1000 live births in South-west Nigeria [7] but consistent with the trend of the gradual decrease in U5MR in Nigeria from 157 deaths per 1,000 live births in 2008 to 132 deaths per 1000 live births in 2018 (NDHS 2018). Rural settlements had the highest under-five mortality rate compared to urban settlements. This result was similar to the trend in NDHS [7].

The factors influencing the likelihood of survival among under-five children in the study were literacy level of the mother, place of residence, low parity, educational qualification of mothers, living in a house with a finished floor, and mothers' age at first birth. The determinants of child survival in this study are similar to the findings of Adeyinka et al. [20] that maternal-level factors such as maternal education, contraceptive use, maternal wealth index, parity, death of previous children, and quality of perinatal care accounted for high variation (39%) in childhood mortalities across communities. And the report of Osika et al. [21], on Under-5 Mortality and Its Associated Factors in Northern Nigeria: Evidence from 22,455 Singleton Live Births (2013–2018) used an adjusted model that revealed geopolitical zone, poor household, paternal occupation, perceived children's body size at birth, caesarean delivery, and mothers and fathers' education, children of fourth or higher birth order with shorter interval ≤ 2 years, and mothers who did not use contraceptives to be associated with increased odds of under-five mortality.

NDHS 2018 also reported that demographic characteristics of both mothers and children such as sex of the child (boys are more likely than girls to die), place of residence (U5MR is higher in rural than in urban areas), mother's education, household wealth (mortality decline with increasing mothers' education and household wealth), mother's age at birth, birth order, previous birth interval (under-5 mortality rate is higher among children with birth intervals of less than 2 years and children of mothers who have given birth to seven or more children), and infant's size at birth have been found to play a significant role in the survival of children in Nigeria.

In the same vein, Sanni et al. [22] also established that socio-economic and proximate factors were important determinants of under-five

mortality in Benin. The study on the proximate and socio-economic determinants of under-five mortality in Benin revealed that the risk of death was found to be higher in children born in the Plateau region (aOR=3.05; 95% CI: 1.29 to 7.64), in rural areas (aOR=1.45; 95% CI: 1.07 to 1.98) and children with ≥ 4 birth rank and >2 years of birth interval (aOR=1.52; 95% CI: 1.07 to 2.17) and higher in children whose mothers had no postnatal check-up (PNC) visits after delivery (aOR=1.79; 95% CI: 1.22 to 2.63) [23].

4. CONCLUSION

The study identified literacy level, place of residence, low parity, educational qualification of mothers, and type of flooring materials as determinants of child survival in southwest Nigeria. Therefore, all stakeholders including the Government, Aid Institutions, healthcare providers, and families should develop more effective responses to these determinants of child survival to ensure sustainable and realistic measures within the society to increase the survival of under-five children.

CONSENT AND ETHICAL CONSIDERATION

Ethical approval was obtained from the University of Ibadan/ University College Hospital Institution Ethics Review Board. Permission and consent were also sought from the State Ministry of Health and leaders of the communities involved respectively. And Informed consent was obtained from the participants of this study.

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CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest in the publication of information obtained from our study, as it was self-sponsored with no financial aid from any donor or organization.

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