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Abstract Autism spectrum disorders (ASDs) are a range of neurodevelopmental disorders whose aetiologies are largely unknown. In the past few decades, studies have demonstrated that ASDs occur globally, and that the numbers of recorded cases are rising; however, determining the true prevalence figures is still a major challenge, especially in developing nations. Also, subtle differences in cultural norms might impede timely/accurate diagnosis and categorisation of patients. In this review, we examine the globally-available data on the prevalence of ASD and discuss some of the challenges of data acquisition, with reference to how these may impact the reliability of figures obtained. Some of the facts, fallacies and limitations relating to the presently-available figures are also highlighted.

Keywords Neurodevelopment, Aetiology, Prevalence, Autism, Data

1. Introduction

Epidemiology is not only concerned with patterns of disease occurrence within human populations, but it is also concerned with the factors that determine or influence development of disease, or maintenance of health. Over the years, different study designs (surveillance, descriptive, analytical, cohort, case-control and cross-sectional) have been employed in examining the relationships that may exist between disease and disease determinants in defined human populations. Generally, epidemiological investigations of neuropsychiatric diseases begin with cross-sectional surveys, which help to determine the prevalence of the disease condition, patterns of risk factors, as well as the possible correlates between disease and risk factors among representative samples [1]. The first epidemiological survey of autism was initiated in England in the early to mid-1960s [2, 3], while the first hospital-based survey in sub-Saharan Africa was conducted in five countries in the late 1970s [4]. Autism surveys have since become global, with different countries conducting surveys to determine the prevalence and risk factors in their communities [1, 5], and thereby propose strategies to improve identification, diagnosis, management as well as promote policy reforms that bring awareness to the plight of the autistic child.

The term ‘Autism’ derives from the Greek word "autos", meaning "self"; and it was in the year 1911 that Eugen Bleuler first used the word autism in describing a symptom of schizophrenia. However, in 1943 and 1944 respectively, Leo Kanner (USA) and Hans Asperger (Germany) described individuals with social/emotional limitations and withdrawn behaviours. Kanner reported behavioural aberrations such as poor social interaction, obsessiveness, stereotypic movement, and echolalia in the affected children. It was Kanner who first coined the term ‘infantile autism’ (earlier called Kanner’s syndrome) to describe his observations in this group of children who seemed socially-isolated and withdrawn [6]; while Asperger named the condition he observed Asperger’s syndrome. Decades of research will eventually reveal that both syndromes are parts of a highly-variable spectrum of disorders. Autism spectrum disorders (ASDs) are an array of neurodevelopmental disorders characterised by cognitive and neurobehavioural deficits, whose underlying factors are genetic and/or neurobiological [7]. In the Diagnostic and Statistical Manual (DSM) III, autism debuted in 1980 as "infantile autism", which was replaced by the term "Autistic Disorder" in 1987. In the DSM IV, it was referred to as pervasive developmental disorders (PDDs); and consisted of autistic disorder (autism), Asperger disorder, childhood disintegrative disorder, Rett syndrome, and PDD-not otherwise specified (NOS).

Over the years, a lot has changed about our perception of ASDs, the perceived risk factors, core diagnostic criteria,
and even approaches to management. Presently, according to the DSM V, persistent deficits in social communication/social interaction and a restricted/repetitive (stereotypical) patterns of behaviour, interests or activities; which must be present in the early developmental period (but might not become obvious until social demands exceed limited capacity), cause clinically significant impairment (in social, occupational or other important areas of current functioning) and must not be better explained by intellectual disability or global developmental delay, are the core criteria for the diagnosis of ASD [8]. DSM 5 also makes provision for differential diagnosis such as 'social communication disorder'. Level of severity of symptoms (3 levels given for both social communication/social interaction, and restricted/repetitive (stereotypical) patterns of behaviour) determines the degree of supportive care needed, with level 3 severity requiring very substantial support. Apart from the core symptoms, patients often have co-morbid psychiatric and behavioural manifestations like self-injury, aggression, impulsivity, hyperactivity, anxiety and mood symptoms; all of which may worsen the overall prognosis, stress the caregivers, and further complicate management. Recently, results from epidemiological surveys indicate that the global prevalence of ASDs is on the rise; although data from sub-Saharan Africa and a number of other developing countries still show numbers that are generally lower than those from the developed countries [9-11]. Whether this reflects an absolute low prevalence, deficits in diagnostic skills, mal-adaptation of diagnostic criteria as it relates to cultural differences in behaviour, or under-sampling is still being studied.

The aetiology of ASD is still being studied, and despite years of research, a complete understanding of the causative factors is still elusive; and while it is now known that genetics may play a big role in ASD, a rapidly increasing prevalence suggests a bigger role of environmental factors. Generally, abnormalities in neural connectivity involving synapses, tracts and neuronal communication via neurotransmitters are key pathological features of the brain in autism [12]. Neurodevelopmental defects in synapse formation/elimination and changes in ratios of inhibitory/excitatory synapses leads to defective local and long range connectivity [12]. An active neuroinflammatory process involving the cerebral cortex and the cerebellum; with associated loss of cerebellar Purkinje cells, marked reactivity of the Bergmann’s astroglia in areas of Purkinje cell loss, marked astrogial reactions in the granule cell layer and cerebellar white matter, and astrogial reactions in the middle frontal/cingulate gyri had been demonstrated by neuropathological examinations [13]. This neuroinflammation may have a strong link to autoimmunity, based on demonstrable elevated levels of immunoglobulins (IgG, IgM and IgA) against select neuron-specific antigens in ASD children [14]; and a significantly higher presence of serum auto-antibodies to the human brain (notably the cerebellum and cingulate gyrus) in autistic children [15].

The cause(s) of the above-mentioned pathological changes are traceable to both genetics and the environment. The heterogeneity of ASD is not only reflected in its behavioural manifestations, but also in the genetic basis, as many candidate ASD genes have been studied or implicated [16]. Also, while studies may differ in terms of their conclusions regarding the degree of involvement of genetics, it is generally accepted that genetics plays a crucial role in ASD. Presently, candidate genes that have been implicated in ASD include those that encode for neural adhesion molecules, ion channels, scaffold proteins, protein kinases, receptor/carrier proteins, signaling modulator molecules, and circadian relevant proteins [17]. Environmental factors that had been linked to ASD-associated neuroinflammation and immune dysfunction include early-life exposure to various xenobiotics including heavy metals such as lead, mercury and aluminium [18]. The Ethyl mercury compound (Thimerosal) is a bacteriostatic agent that was a component of a number of childhood vaccines in Western nations. The possibility of its involvement in ASD led to its removal from many vaccines meant for children; and while it must be noted that this was not accompanied by a sharp decline in ASD prevalence, its continued use in vaccines given to pregnant women further complicates the picture [18]. The use of aluminium(Al) as an adjuvant in many vaccines has continued, due to the fact that Al salts help to stimulate the immune system to yield adequate antibody titres [19]. However, there is abundant scientific literature on the neurotoxic effects of Al; and its ability to adversely affect both the immune and the nervous systems, hence making it a plausible risk factor for triggering ASD [18]. Al’s ability to alter neuronal gene expression can also affect the response of neurons to environmental insults such as toxins [18]. The presence and abundance of environmental risk factors may be a major determinant of geographical variations in the true prevalence figures of ASD; however, the wide variety of candidate environmental risk factors makes matching environmental factors to prevalence a challenging task.

There have also been reports suggesting that some of the behavioural characteristics of “autistic” children in developing countries differ, when compared to those in developed nations [20, 21]. Along this line, how prevalence figures are influenced by the beliefs and cultural heritages of the different regions of the world is a matter of debate. In this review, we discuss the global epidemiology of ASDs by highlighting the incontrovertible facts relating to its prevalence, fallacies of misinterpretation of available figures as they are, and limitations of data acquisition, diagnosis and categorisation of patients. We also summarise how these factors impact strategies to improve identification, diagnosis and management; as well as promote policy reforms.
1.1. Global Prevalence of ASDs

1.1.1. Prevalence in USA, Europe, China, Japan, Middle East, Ecuador, Brazil and Mexico

Global data on the prevalence of disorders that now fall under the term ASDs had been available before 2013. In a 2012 review that compared prevalence data from different parts of the world (excluding sub-Saharan Africa), the researchers estimated the median global prevalence of 17/10,000 (approx. 1 in 588) for autistic disorder, and 62/10,000 (approx. 1 in 161) for all pervasive developmental disorders; while suggesting that the increase in estimates over time and the variability between countries and regions may be linked to diagnostic switching, the broadening diagnostic criteria, service availability and the increasing global autism awareness [22]. Even prior to this, the epidemiology of ASDs had portrayed a shifting dynamics, with prevalence increasing from 2-4/10,000 children as reported in the 1940s [23], to approximately 4-5/10,000 children, according to the studies that were published in the 1960s and 1970s [24, 25], 11/1000 children in the USA, according to a survey conducted about a decade ago [26]; while a Centres for Disease Control and Prevention surveillance report revealed a combined estimated prevalence of 14.6 per 1,000, or 1 in 68 children (aged 8 years, whose parents or guardians resided in 11 ADDM Network sites) in the United States [27]. The most recent CDC figures on ASD published in 2015 (which are believed to be more accurate) say 1 in 45 children in the USA have ASD; this is however based on a parent survey which was designed to track the prevalence of developmental disorders in children aged 3 to 17 years [28]. Studies in Europe recorded before 1999 reported prevalence rates ranging from 1.9 to 72.6 per 10,000 with a median of 18.75/10,000; while studies conducted after 1999 reported rates ranging from 30.0/10,000 to 116.1/10,000; with a median rate of 61.9/10,000 [22]. In the United Kingdom, a 2006 study in 9-10 year-olds reported a prevalence of childhood autism as 38.9/10,000, while other ASDs (DSM III) was 77.2/10,000 (52.1-102.3), making the total prevalence of all ASDs 116.1/10,000 [29]. However, in 2014, the National Autistic Society reported that 1 out of every 100 children has ASD [30]. In China, it was estimated that 1.1 in every 1,000 children are diagnosed with autism [31]; while in an analysis of five studies from mainland China, an estimated pooled mean prevalence of 24.4 per 10,000 children was observed [32]. In a 2012 review of epidemiological studies conducted in the Western Pacific region (including Japan and China) since 2000, Elsabbagh et al. [22] reported that prevalence rates varied from 2.8/10,000 to 94/10,000 with a median value of 11.6/10,000. In the Middle East, the prevalence of ASD was reported to be 1.4/10,000 in Oman, 29/10,000 in the United Arab Emirates, and 4.3/10,000 in Bahrain [33-37].

In Canada, the National Epidemiological Database for the Study of Autism in Canada (NEDSAC) ranks ASD as one of the most common developmental disabilities, affecting 1 in 94 children [38]. A pilot study that was conducted in Brazil reported a prevalence rate of 27/10,000 [39]; while the prevalence of ASD in regular schoolchildren in Quito, Ecuador was found to be 11/10,000 persons [40]. The Leon survey in Mexico reported an overall prevalence of 87/10,000; a rate that was deemed consistent with other studies conducted at a similar period [41].

1.1.2. Prevalence of Autism in Sub-Saharan Africa, India and the Caribbean Islands

According to the World Health Organisation, the global prevalence of ASD has been estimated as 1 per 160 persons [42]. However, the contribution of sub-Saharan Africa (SSA) to this burden is largely unknown due to a paucity of population-based surveys on autism in this region [10, 11, 22, 42, 43]. Data (largely from hospital-based studies) are however available from a few countries in the region. In south-west Nigeria, Lagunju et al [44] reported a prevalence rate of 2.3% (1 in 43.5) amongst 2,320 first-time attendees of a neurology or child psychiatry clinic. In another clinic-based study in south-eastern Nigeria, prevalence of ASD was reported to be 0.8% (1 in 125) of the total number of children attending the clinic for that year [45]; while in Uganda, a survey of 1,169 children aged between 2 and 9 years reported an unadjusted prevalence for ASD of 6.8/1000 [46]. All studies reported a male predilection, and middle to high socioeconomic status improved the likelihood of a child being evaluated for ASD. While these studies provided some data, the absence of data from large scale epidemiological studies from a number of countries in this region have been suggested as a possible reason for the perceived low incidence and/or prevalence of autism observed in SSA [10, 11].

Until recently, India (like SSA) had a paucity of community-based population studies for autism; although there was a number of hospital-based autism clinical assessment studies [47-49]. However, in a 2017 population-based study (of 28,078 children aged between 1 and 10 years, cutting across geographical regions that represent rural, urban, and tribal populations in India) using the Hindi version of the Indian Scale for Assessment of Autism; a prevalence of 0.15% (1 in 667) was reported, with a male sex predilection [50]. Also, a high socioeconomic status increased the likelihood of an ASD diagnosis [50]. The prevalence of ASD in the study was observed to be higher amongst children aged between 4 and 10 years with majority of them diagnosed with mild autism; while amongst children aged between 1 and 7 years, the diagnosis of moderate autism was prevalent. This was however attributed to families delaying presentations till the onset of delayed motor and speech development [50]. In an earlier study, the same authors (sampling 11,000 children within the same age range, and from the same
region) reported a prevalence of 0.0009 % (1 in 1100), with low socioeconomic status correlating positively with autism [51].

In the Caribbean islands, the Aruba Autism Project determined the prevalence of ASDs in birth years 1990–1999 in Aruba, and found a figure of 53/10,000 [52].


Autism fact sheets from different advocacy groups (Autism Society, National Autism Association, National Autism Network, Talk About Curing Autism, National Autism Network, Autism South Africa, Action In Autism, Autism Speaks etc.) irrespective of region or country generally accept and reiterate that autism is a bio-neurological developmental disability which generally appears before the age of 3; impacting normal brain development in the areas of social interaction, communication skills, and cognitive function. There have also been suggestions that autism is a disease of developed countries, with a male sex predilection, that does not affect life expectancy. While currently, there is yet no cure for autism, early diagnosis and treatment helps to improve the diverse symptoms associated with autism.

2.1. ASDs Occur Globally

In relation to the prevalence of ASDs, data emanating from developed nations appear more comprehensive and reliable, compared to those from developing nations. Despite this, one fact that can no longer be denied is that as it stands today, ASDs occur globally irrespective of culture, geography or degree of industrialisation; with variable degrees of tangible data from different regions of the world where studies had been conducted. Hence, contrary to what might have been believed in the past, especially in the developing countries, it is not a disorder of ‘the West’ or of advanced nations. The realisation of this fact is of particular importance in SSA and other regions of the world where awareness levels are still growing.

2.2. ASD Prevalence Figures are Still Rising

Globally, the recorded prevalence figures for ASDs are rising; and from a statistical point of view, this is undeniable when we examine data from both developed and developing countries. However, in many developing countries, the reported rates continue to be significantly lower than the developed countries [9]. Whether this truly reflects an absolute low prevalence, deficits in diagnostic skills, mal-adaptation of diagnostic criteria as it relates to cultural differences in behaviour, or under sampling are issues that continue to be discussed. The idea that the low prevalence rates observed in SSA could be due to underreporting stemmed from studies conducted amongst children born to African immigrants in Sweden [53-55], that reported high prevalence rates in this subset of the population, compared to the indigenous population. The possibility of late diagnosis or misdiagnosis has also been considered, and studies have shown that African children are more likely (than Caucasian children) to have a late diagnosis of ASD [56], or a misdiagnosis [57].

Despite the lower figures (when compared to developed nations), it is safe to say that even in SSA, the prevalence rates of ASDs are on the rise; and there has been an ‘improvement’ from an era of no prevalence figures [22] to the availability of hospital-based [44], or community–based [46] prevalence figures. Also, in India, the prevalence from a 2017 study [38] revealed a rise from an earlier 2015 study [51].

In developed nations, a number of researchers have attributed the rise in ASD prevalence to an increasing ability to diagnose, or a possible reflection of the success of public health systems in better-identifying children who were previously undiagnosed [58]; and this is also related to the continued redefinition of diagnostic criteria [22]. An increased awareness is also thought to be largely responsible for changing figures in less developed regions of the world, such as SSA [10, 11], and Asia [50, 51]. Comparing the two Indian studies cited earlier [50, 51], it is obvious that more children were recruited in the 2017 study than were in the 2015; suggesting that in the 2 year period, more families were aware enough to want to seek diagnosis and treatment for their wards. There is also evidence of increasing awareness, cultural reorientation and the availability of well-trained child and adolescent care specialists and allied professionals in SSA. In the last decade, particularly in the last 5 years, the number of ASD related studies in this region [44, 46, 59-61] has increased considerably, compared to the preceding decades.

A review of a recent CDC data published in the National Health Statistics Reports [28] also supports the theory that changes in awareness, earlier diagnosis, and redefinition of diagnostic criteria has a lot of impact on prevalence figures. While the autism rate appeared to rise 79 % over a 3-year period, the rate of developmental delay dropped 36 % [28]; and the combined prevalence of children diagnosed with autism, developmental delay and intellectual disability did not change over the 3 years. The unchanging statistic of the sum data suggests that a number of children who were once tagged as having developmental delay or intellectual disability are now being identified as having autism [28].

In a study involving Danish children, Hansen and colleagues [62] were also of the opinion that the increase in prevalence of ASD was actually due to changes in how the disease is diagnosed [62]. By using data from a large study involving 677, 915 Danish children (born between 1980 and 1991) and tracked until they either had an autism diagnosis or reached the terminal date of the study (Dec. 31, 2011); the authors concluded that significantly more
children were diagnosed with autism in 1995 and thereafter, than before 1994 (when autism became a spectrum of disorders in Denmark) [62]. However, the authors also noted what appears to be a certain degree of real increase in prevalence.

Several researchers also share the opinion that there is a real global rise in prevalence of ASDs, and the rise may be the product of several factors such as exposure to environmental toxins and increasing parental age/genetic susceptibility [63-65]. Immune dysregulation in pregnancy has also been linked to the rising prevalence of ASD; and autoimmune inflammatory disorders, such as coeliac disease and rheumatoid arthritis in mothers are believed to increase the risk [66]. Inflammation due to common infections and endemic parasitic illnesses are probably not likely associated with increased risk; and this is consistent with the observation that in some developing nations such as Nigeria or Cambodia, where parasitic and infectious diseases are still common, recorded ASD prevalence is still low [45, 67].

The continued increase in prevalence figures of ASDs in developed countries led to the postulation of the “Biome Depletion Theory” by some researchers, who believe that maternal immune response overreaction is a factor underlying the development of ASDs in offsprings. According to this theory, our immune system has co-evolved alongside microbes and parasites, but a lack of these pathogens in urban, post-industrial societies leads to immune system over reactivity [67]. Along this line, it was suggested that pro-biotics may be able to control the inflammatory response in pregnant women, and prevent some cases of ASD; however, this notion still seems like a shot in the dark, and studies will have to be conducted to examine this.

The apparent induced immune system over-reactivity also formed the basis of an implied link between vaccination and ASDs. In 1998, a case series published by Wakefield and colleagues, but later retracted by 10 of the 12 authors suggested that the measles, mumps, and rubella (MMR) vaccine could predispose to behavioural symptoms that are representative of ASDs in children. Despite certain obvious shortcomings of this study (including the very small sample size (n=12)); the publication generated a social firestorm that led to some parents rejecting vaccination for their children. However, epidemiological studies conducted thereafter failed to establish such a link [68, 69]. The CDC also continues to reiterate its position that no such links exist. Again, a number of developing countries who have contributed to the global data on ASD prevalence do not have immunisation regimens like MMR; and even if they do, data establishing a link appear non-existent. From the foregoing, the following are apparent: a) an undeniable deduction from the study by Hansen et al [62]is that not all new cases of ASDs are explicable by changes in diagnostic ability; hence, it might be unscientific and over simplistic to attribute all to improved ability to diagnosis b) The public response that followed the Wakefield article attests to the societal and social burden of ASDs, and the dangers of the inability of science to find a sound and timely answer in relation to the cause(s) of a disorder that continues to plague more children. It is therefore imperative to continue to research and identify environmental and social factors that may increase risk of ASDs.

2.3. ASD has a Male Sex Predilection

Sexual predilections in disease prevalence are well-recognised, and female predilections have been reported consistently in a number of disorders with autoimmune aetiologies [70] while a male preponderance has been observed in some neurodevelopmental disorders [71-73] ASDs have also been observed to have a higher prevalence in males, compared to age-matched females; in a 4:1 ratio. This observation has been consistent across populations, regions and time; strongly suggesting the involvement of sex-specific biological factors in ASD aetiology [74, 75]. Genetic studies have demonstrated that females are protected from the effects of de novo and heritable ASD risk variants, with suggestions that sex hormones or sex chromosomal genes may modulate these genetic variations [74], for a detailed review on the influence of sex in autism (see Halladay et al., [75]).

2.4. ASD and Life-expectancy

It is generally believed that autism per se does not affect life expectancy; however, research continues to show higher mortality risk among individuals with ASD. In comparison with mortality statistics from the general population or general population controls, the risk of premature mortality has been estimated to be 2-fold to 10-fold higher in the ASD population; even autistic adults without a learning disability are 9 times more likely than controls, to die by suicide [76]. Also, risk of mortality is higher in females, compared to males [77]. Accidents such as drowning and co-morbid medical conditions such as epilepsy are among the classic causes of death; however, these cannot fully account for the life span gap between autistic and non-autistic people, or the difference in mortality between autistic people with and without an intellectual disability [76]. One of the factors that could account for this gap is an increase in the prevalence of health problems such as diabetes and respiratory disease; and the fact that these health problems may go unnoticed until it is too late [76]. Among autistic adults, pressures of meeting the obligations of ‘normal life’ may lead to continued isolation, depression and suicide. The relationship between ASD and life-expectancy deserves further studies, especially, with the realisation that certain life-threatening medical conditions are more common in ASD patients. Therefore, it might be erroneous to simply
state that ASD does not affect life-expectancy without explaining the ever-increasing complexity of the relationship.

3. ASD Global Epidemiology: Limitations of Acquisition, Interpretation and Viability of Data

An accurate global comparison of data relating to the prevalence of ASDs is a rather challenging task, due to factors such as; a) the absence of data from large scale epidemiological studies from a number of countries, especially in the sub-Saharan countries like Nigeria (where most of the available rates emanated from hospital-based studies); even, developed nations like the USA cannot boast of a truly all-inclusive national survey, probably due to impediments of cost effectiveness and logistics b) the information gathering tools are not totally adaptable to or may not yield 100% accuracy in some regions of the world because of certain cultural peculiarities that might affect diagnosis or categorisation c) there could be wide regional variations in figures arising from the same country, as is the case with China [32].

3.1. Absence of Population-based Prevalence Data in Developing Countries

The prevalence figures of ASD in sub-Saharan Africa have been based mainly on a few hospital-based studies, and hardly any community-based study, except that of Kakooza-Mwesige et al [46] in Uganda. Under these circumstances, under-sampling or ‘skewed’ sampling have been suggested to negatively impact the reported prevalence [10, 11]. The study by Lagunju et al [44] was conducted in a tertiary hospital setting in south-west Nigeria, while that of Bakare et al [45] was conducted in a similar setting in south-eastern Nigeria. These centres are the ultimate referral centres for paediatric patients in their respective regions and they represent a ‘gathering point’ for all ‘puzzling’ and ‘unusual’ childhood illnesses. First, it must be noted that there are other regions (in the country), for which there are no data. Secondly, confidently drawing an inference from such studies is associated with two potential pitfalls; that of under-representation, due to an apparent small sample size, compared to the total population of children within the age range; or of over-representation, because the sampling frame is compelled to fall on an area where such cases are likely to cluster. This clustering effect may be the apparent fr from the

3.2. Impact of Culture

Cultural differences play a large role in disease diagnosis, especially when considering the diagnosis of disorders that tend to attract a lot of social stigma; therefore, despite adequate sensitisation and awareness, parents may still refuse to submit their children for ASD evaluation. For instance, in South Korea, a risk of intense stigmatisation makes many families of children with developmental delays to intentionally avoid diagnosis of ASD; also cultures that believe that speech development in the male child is usually slower than females make seeking early help for the child to be impossible [9]. Therefore, societal or parental behaviours affect ASD prevalence figures.

The lack of a culturally-adaptable tool for ASD screening constitutes another impediment to having reliable prevalence data; since culture/language differences might affect diagnosis rates. Different cultures have peculiar behaviours that are at least acceptable, if not even desirable. Diagnosis of ASD is not based on laboratory tests, but rather, on the exhibition of certain behaviours. Cultural perceptions affect the exhibition of at least some of these behaviours; and in different cultures, parental perceptions of their presence or otherwise affect the timing of seeking help for a child with possible ASD. Therefore, behaviours that are considered normal in some cultures may fall within the inclusion criteria for ASD diagnosis.

Generally, in Europe and America, children are expected and encouraged to make eye contact with others; but in other parts of the world such as Asia and Africa, or even among native communities in America and Europe, this is not encouraged, and may even be perceived as rudeness or insubordination, especially, when interacting with adults. This has made certain researchers to be of the opinion that the matter of use of eye contact as a diagnostic criterion for autism needs to be handled with caution. There are also cultural variations in the degree of a child’s interaction with others, especially with adults. There are cultures all over the world (Africa, Asia, Central and South America) that don’t encourage ‘undue’ interactions between children and adults (especially strangers). How children in these cultures form relationships may not be exactly what is
taken to be normal in urban Europe or America; and ASD diagnosis in these communities may face an uphill task when the children encounter these ‘strangers’ (healthcare personnel) that are questioning, examining and observing them. Along this line also, language development may be difficult to assess with all certainty, as the child may simply be scared or ‘ashamed’ to talk to an unfamiliar adult; leading to a situation where the parents vouch that the child could speak, but he/she will refuse to communicate during the assessment.

Since cultural differences may impair diagnosis of ASDs, it is imperative to develop universally-adaptable diagnostic criteria that are applicable to all cultures. In order to achieve this, studies must be conducted across cultures to find common markers that consistently differentiate children with ASD from typically-developing children. These markers are to be inserted as probes when gathering data from communities. This gives an opportunity to conduct a thorough and truly-comparable epidemiological research, which gives rise to more reliable figures. Until this has been achieved, it might be erroneous to simply assume that the same criteria can be applied across different cultures, without the need for culture-based adjustments.

4. Conclusions

While a lot of progress had been made in the global awareness of ASD, much remains to be done in order to have a more accurate picture of the trend or global burden of the disorder; and as science strives to understand more about it, our minds need to be continuously open to do away with certain erroneous or inaccurate impressions. However, reaching an accurate diagnosis, accessing therapy, acquiring epidemiological data and determining true prevalence figures are still major challenges, especially in developing nations. Also, research needs to focus on dealing with cultural and social norms/peculiarities that may hinder early diagnosis and application of appropriate interventions. Continuous development and application of culture-friendly and yet globally-comparable diagnostic tools will go a long way in bridging the gap in the ability to diagnose ASD that exists between developing and developed nations. Finally, large scale epidemiological studies will help towards obtaining a truer picture of the prevalence of ASD in developing countries, especially in sub-Saharan Africa.

Compliance with Ethical Standards

This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest

Onaolapo AY declares that she has no conflict of interest. Onaolapo OJ also declares that he has no conflict of interest.

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