

## Common Physiology Textbooks Used in Nigerian Medical Schools-Need for a Broad-Based Review

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### Abstract

The future of medical education is highly dependent on the quality of teaching tools employed by the educators. Textbooks are vital tools for teaching as they are valuable resources in the process of education. The basic medical sciences forms the foundation for medical training, and Physiology education is key. Nigerian (and indeed African) medical instructors are highly dependent on the developed world for the textbooks and research materials they employ in training their students. They common Physiology textbooks they use are mostly by non-African authors. These textbooks as beautiful and voluminous as they appear fail to fully capture information that reflect some of the pathophysiological peculiarities of the Nigerian/African population. Such an information gap has the capacity of creating a disconnect between the actual knowledge acquired in school and the practical situation present in the society. Considering the current paucity of research work from local authors there is need for more pro-activeness from indigenous researchers to bridge such gaps. Both government and private sector participation is also needed towards supporting the writing of physiology textbooks with a broader all-encompassing approach. This is a step that can pave way for an academic revolution not only in Nigeria but in the entire African continent.

### Introduction

Textbooks are core learning media composed of text and/or images designed to bring about a specific set of educational outcomes, with an inherent power to transmit knowledge, develop skills and shape the learner's world view. Textbooks can also function as valuable resources in the process of education for sustainable development and disease prevention. A good textbook therefore is one that engages the students and relate to their realities [1]. Textbooks and resources should be considered as an integral part of establishing, within education arrangements, the policy intentions of a national curriculum. High quality textbooks are therefore necessary tools for effective teaching [2].

Textbooks and other learning materials are expected to be in sync with and relevant to process of survival and progress of society. Today, there is a dire need to domesticate textbooks for students in Nigeria to reflect local context [3]. Another study also showed that even though indigenous textbooks are fairly patronized by Nigerian universities, a greater percentage of resource allocation for textbooks are still being absorbed in the development and management of foreign textbooks [4,5].

The commonly recommended Physiology textbooks for the training of pre-clinical medical students in Nigeria are Guyton and Hall textbook of Medical Physiology; Ganong's review of Medical Physiology and Essentials of Medical Physiology by Sembulingam. The first two are written by American authors while the last is by Indian authors. The styles of presentations in these books are by far (no doubt) more excellent than the very few by our local authors. However it is worrisome that key subjects relevant to the African medical students are either completely missing or scantily discussed.

### Areas of lapses in physiology textbook for Africa

**Blood physiology:** It is a well-known fact by various researchers that the haematological reference values for the blacks are not same with the whites. These textbooks use purely Caucasian values without any mention of the variations as touching other races. The White blood cell (WBC) count is placed at about 7000/ $\mu$ L in Guyton, the other textbooks gave the range as between 4000-11000/ $\mu$ L.

Recent findings revealed that people of African descent (>10-20%), have a race-specific WBC and absolute neutrophil count (ANC) reference intervals [5]. It is also known that a locus on chromosome 1q is strongly associated with WBC ( $p < 10^{-12}$ ) and individuals with the West African alleles have a mean WBC of 4.9 (SD 1.3) while those with the European alleles have a mean WBC of 7.1 (SD 1.3). This variant is said to explain the ~20% of population variation in WBC [6]. In Jamaica it is reported that the presumed neutropenia reported by various health services was as a result of wrong normal reference values which are based on values drawn from Caucasian population [7]. Studies in Nigeria report significant differences in normal haematological ranges compared with those of other African countries and the developed world which could be due to a number of reasons such as differences in geographical locations, climate, dietary habits, and environmental factors or ethnic and tribal peculiarities. A recent Nigerian study places the Mean WBC count of males at 4400/ $\mu$ L (Ref. range 4300-4600) while that of females is 4600/ $\mu$ L (Ref. range 4400-4800) [8]. Despite all these evidences, our popular physiology textbooks are still non-inclusive of Africans.

A common genetic blood disorder prevalent in sub-Saharan Africa is sickle cell anaemia [9]. This very important cause of anaemia in Nigeria is discussed very briefly in Guyton with about 165 words and about 171 words in Sembulingam. Ganong made no mention of it

anywhere. On the other hand, Leukaemia had a 333 words discussion in Guyton and Haemophilia 486 words.

The sickle cell foundation said “Nigeria has the largest population of people with sickle cell disorder, with about 150,000 births annually. The incidence of sickle cell anemia in Nigeria is among the highest in the world, with more than 100,000 Nigerian children being born each year with the disorder. Those with the disease suffer a higher than average frequency of illness and premature death, especially in infancy. The condition can also cause heart attacks, kidney failure, severe infections and sudden death [10,11].

Malaria is highly endemic in Nigeria and other West African countries. The African Region alone accounts for 85% of malaria cases and 90% of malaria deaths worldwide. It commonly causes anaemia in children and pregnant women in Africa, and at least one child dies from malaria every 30 second [12]. This vital topic is completely omitted (under blood physiology) in all the commonly used textbooks.

**Nerve and muscle physiology:** Tropical ataxic neuropathy (TAN), a syndrome characterized by sensory polyneuropathy, sensory ataxia, bilateral optic atrophy and bilateral sensorineural deafness has occurred in endemic forms in several African countries. Chronic cyanide intoxication from a monotonous staple cassava diet is thought to be the major aetiological factor [13].

Poliomyelitis has been endemic in Nigeria until 2015. It is still an important disease to know about. It causes irreversible paralysis amongst children 5 years and below [14].

Tetanus infection a common pathologic cause of tetany in Nigeria that deserves attention too. In fact it is said that maternal and neonatal tetanus alone accounts for about 110,000 deaths yearly in Africa [15]. Only Sembulingam gave some highlights about tetanus, Guyton and Ganong were mute on it. None of these textbooks talked about the first two (i.e TAN and poliomyelitis).

**Respiratory physiology:** Tuberculosis (TB) is an important reemerging disease (especially with the advent of the HIV pandemic). Though ancient, TB is not a disease of the past [16]. It is mandatory therefore that young doctors acquire experience in the diagnosis and treatment of this disease, seeing that is not so infrequent as it was a decade or two ago [17,18]. It is amazing that these textbooks gave in-depth narratives on HIV under immunology but said little to nothing about tuberculosis under respiratory physiology.

**Endocrine physiology:** Guyton, while discussing colloid goitre caused by iodine deficiency, said it is common in Swiss, Alps, the Andes and the great lake region of the United States due to insufficient presence of iodine in their soils. This total exclusion of the large goitre belt of Africa is improper. It is a known fact that, apart from the iodine deficiency, most African soils are rich in goitrogens (substances that suppress the function of the thyroid gland by interfering with iodine uptake) thus placing 8% of children born in sub-Saharan Africa at risk of hypothyroidism. Endemic goiters are seen in both mountainous (New Guinea) and non-mountainous regions of Africa (Cameroun, Northern Zaire, Central Africa Republic, Uganda, and Rwanda). The prevalence rates of endemic goiters in Africa range from 1% to 90% [19]. None of these common textbooks made reference to any of the above facts.

**Gastrointestinal (GI) physiology:** Common Caucasian disorders like gluten enteropathy, Crohn’s disease, ulcerative colitis, celiac sprue and idiopathic sprue were given adequate consideration in these textbooks. However, a common intestinal disorder in Nigeria and west Africa-

typhoid enteritis, was completely omitted under GI physiology. This disorder commonly causes intestinal perforation (especially amongst the young) with significant electrolyte derangements. This is still considered the most important surgical complication of typhoid enteritis associated with high morbidity and mortality [20].

**Cardiovascular physiology:** Valvular heart diseases (VHD) from rheumatic fever (RF) and scabies affecting children and young adults are the predominant form of VHD on the African continent. It is a condition initiated by Streptococcal toxin. The highest prevalence of rheumatic VHD is in sub-Saharan Africa with a prevalence of 5.7 per 1000 [21]. Only Guyton made a good presentation on Rheumatic valvular heart lesions. The other textbooks had no segment to discuss this disorder.

**Reproductive physiology:** Due to poor obstetric care and significant home deliveries in Nigeria and most African countries, the incidence of postpartum haemorrhage is escalating. This condition is known to cause Sheehan’s syndrome which has been defined as pituitary hormone deficiency due to ischemic infarction of the pituitary gland as a result of massive postpartum uterine hemorrhage [22]. Neither Guyton, Ganong nor Sembulingam discussed Sheehan’s Syndrome under reproductive physiology.

**Renal physiology:** Black water fever a complication of malaria commonly leads to renal failure and circulatory collapse amongst sufferers in sub-Saharan Africa [23]. This too is not discussed in the foreign textbooks we use for teaching physiology.

**Physiology of special senses:** River blindness (Onchocerciasis) is a neglected tropical disease (NTD) caused by the parasitic worm *Onchocerca volvulus*. It is transmitted through repeated bites by blackflies of the genus *Simulium*. Worldwide it is second only to trachoma as an infectious cause of blindness [24]. This neglected disease was also neglected by these physiology textbooks.

**Neurophysiology:** Post meningitis and post cerebral malaria complications in the central nervous systems are quite prevalent in Nigeria and should have been properly addressed in our textbooks. The highest incidence of bacterial meningitis is observed in the sub-Saharan meningitis belt where cyclic epidemics occur at least once per decade, which could result in wide range brain injuries, hippocampal atrophy and disabling neuropsychological deficits [25,26]. In the same vein, cerebral malaria is the most severe neurological complication of infection with *Plasmodium falciparum*. With over 575,000 cases annually, children in sub-Saharan Africa are the most affected. Surviving patients have an increased risk of neurological and cognitive deficits, behavioral difficulties and epilepsy; making cerebral malaria a leading cause of childhood neuro-disability in the region [26]. Again these important clinical correlates are absent under neurophysiology in our popular textbooks.

## Recommendations

The Nigerian government should emulate a country like Singapore, where textbooks are State-approved and authors are compelled to meet State criteria [25]. There should be a link between theoretical and clinical instructions as well as interdisciplinary and topic-related instructions to provide communities with the necessary doctors [27].

Our leaders should both develop and strengthen other intervention programmes for education like the tertiary education trust fund (Tetfund) in Nigeria. This will help strengthen indigenous research and

support local authors to write high quality books that are relevant to the national peculiarities.

The Nigerian government should also ensure that the organized private sector set aside a yearly seed fund to support local academics who are committed to writing medical books that fully reflect the relevant health issues.

Strong antipiracy laws should be enforced by government to discourage pirates from illegally profiting from the intellectual properties of prospective authors. Pirating discourages local authors.

Nigerian academics must be more proactive in writing medical books to meet the local content needs. This they can achieve through conscious and deliberate collaborative efforts with major physiology bodies like the African Association of Physiological Sciences (AAPS). By so doing the requisite textbooks of high quality (in terms of graphics and presentation) will be made available for the Nigerian and indeed African medical schools.

## Conclusion

It is quite obvious that only Africans can set their own research priorities and agenda [28]. Similarly, only Nigerians can set their own textbook policy agenda. To achieve a quantum leap in the area of physiology (and indeed other medical sciences) education, there is an urgent need to make available for our medical students, textbooks, that can help them appreciate the common health issues that they will encounter both in clinical training and as professionals. A synergy between government, the organized private sector and the academics is quite necessary to get a fruitful headway towards achieving this goal.

## Disclosures

No conflict of interest, financial or otherwise are declared by authors.

## Authors' Contribution

AI Conception of research; AI drafted manuscript; IJO. Edited and revised manuscript; AI and IJO approved final version of manuscript.

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