PUBLIC HEALTH-NUTRITION INTERVENTION PROGRAMME TO ATTENUATE THE PROGRESSION OF HIV TO AIDS AMONG PEOPLE LIVING WITH HIV (PLWH) IN ABUJA, NIGERIA: A CONCEPTUAL FRAMEWORK

Abraham Mainaji Amlogu*[1,2], Kate Godden[1] and Ihab Tewfik[1]

University of Westminster, UK

Sundus Tewfik[3]

London Metropolitan University, UK

Charles Wambebe[4]

Ahmadu Bello University, Nigeria

Abstract: HIV/AIDS is a pandemic disease and its scourge has had a devastating impact on health, nutrition, food security and overall socioeconomic development in countries that have been greatly affected by the disease. In 2007, sub-Saharan Africa (SSA) remains the region most heavily affected by HIV/AIDS, accounting for 67% of all people living with HIV and for 75% of AIDS deaths. The engagement of HIV/AIDS with under-nutrition form a symbiotic relationship and one increases the prevalence and severity of the other. HIV infection increases energy requirements through increases in resting energy expenditure, reduced food intake, nutrient mal-absorption, negative nitrogen balance and metabolic alterations that lead to weight loss and wasting. Moreover, intervention programmes, which simply employ antiretroviral drugs, have been found to lack effectiveness particularly when the patient is under-nourished. Preliminary evidence indicated that improving nutrition status might improve some

*Corresponding author: Dr Abraham Mainaji Amlogu: amloguab@yahoo.com; abraham.amlogu@my.westminster.ac.uk
[1]School of Life Sciences – University of Westminster, London, 115 New Cavendish Street, W1W 6UW, UK
[2]State House Medical Centre, P.M.B 316, Aso Rock, Abuja, Nigeria
[3]School of Human Sciences, Faculty of Life Sciences – London Metropolitan University
[4]Ahmadu Bello University, Zaria, Nigeria

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HIV-related outcomes. This presented conceptual framework perhaps answer the urgent need for renewed focus on and use of resources for nutrition as a fundamental part of the comprehensive package of care at the country level. The expected outcome of this framework will have direct effect on 90% of HIV infected subjects in West Africa *vis-à-vis* slowing down /eliminating the progression of HIV to AIDS.

Keywords: *HIV; AIDS; Public Health; Nutrition; Food Security; Conceptual framework; Intervention programme; Antiretroviral drugs.*

BACKGROUND TO THE STUDY

HIV/AIDS is a pandemic disease and its impact is worsened by the presence of other conditions such as under-nutrition and opportunistic infections (Anabwani and Nazario, 2005). Sub-Saharan Africa (SSA) remains the region most heavily affected by HIV/AIDS, accounting for 67% of all people living with HIV and for 75% of AIDS deaths in 2007(USAID, 2004; UNAIDS, 2008).

HIV/AIDS and under-nutrition form a symbiotic relationship and one increases the prevalence and severity of the other (Bijlsma, 2000; Yale University, 2007). Moreover, intervention programmes, which simply employ antiretroviral drugs, have been found to lack effectiveness particularly when the patient is under-nourished (FAO/WHO, 2002; Yale University, 2007).

Micronutrient deficiencies significantly contribute to HIV progression to AIDS; deficiencies of essential vitamins (A, B-complex, C and E) and minerals (selenium and zinc), are common in People Living with HIV (PLWH) and these micronutrients are required by the immune system to combat infection (WHO, 2005; Barry, et al, 2007). Furthermore, deficiencies of antioxidants (vitamins and minerals) contribute to oxidative stress, a condition that may accelerate immune cell damage and increase the rate of HIV replication (USAIDS, 2004; Piwoz et al., 2004; Paul et al., 2007).

The effects of under-nutrition on the immune system are well documented and include decreases in CD4 T cells (*cells that produces a specific immunity to a particular antigen*), suppression of delayed hypersensitivity, and abnormal B-cell responses (USAIDS, 2004;

Paul et al., 2007). Interestingly, the immune suppression caused by protein-energy malnutrition mechanism is similar in many ways to the effects of HIV infection (FANTA, 2004; USAIDS, 2004).

An earlier review by Piwoz and Preble (2000); WHO, (2009) examined preliminary evidence that improving nutrition status may improve some HIV-related outcomes. HIV infection increases energy requirements through increases in resting energy expenditure (FAO/WHO, 2002; Piwoz, 2004), reduced food intake, nutrient mal-absorption, negative nitrogen balance and metabolic alterations that lead to weight loss and wasting. Asymptomatic HIV-positive individuals need 10% more energy (per day) than HIV-negative individuals of the same age and sex. The Energy needs of symptomatic individuals are 20 to 30% (per day) above normal (Piwoz, 2004; FANTA, 2004). Only few published reliable studies highlighted the use of macro and specific micronutrients in the intervention and management of HIV/AIDS in Nigeria (Piwoz, 2004; Amuna et al, 2004; Zotor and Amuna, 2008).

SCALE OF THE PROBLEM AND EPIDEMIOLOGY OF THE DISEASE

HIV epidemic has repeatedly defied predictions derived from epidemiological modeling (UNAIDS, 2008). The dimensions of the epidemic remain staggering. UNAIDS reported that in 2007 alone, worldwide, an average of 33 million [*30–36 million*] people were living with HIV, 2.7 million [*2.2–3.2 million*] people became infected with the virus, and 2 million [*1.8–2.3 million*] people died of HIV related causes. Also, in 2007, the estimated number of new HIV infections was 2.5 times higher than the increase in the number of people on antiretroviral drugs in that year, underscoring the need for substantially greater success in preventing new HIV infections (UNAIDS, 2008).

PREVALENCE AND INCIDENCE AT NATIONAL LEVEL IN NIGERIA

The first case of HIV/AIDS in Nigeria was reported in 1986. Since then the number of people living with HIV or AIDS (PLWHA) steadily increased and the epidemic moved into a 'generalized' state with an increase in sero prevalence from 1.8% in

1991 to 5.8% in 2001 (FMOH, 2007). A slight drop to 5.0% was recorded in 2003 which was sustained in 2005 with a sero prevalence rate of 4.4%. According to a UNAIDS Report 2009, the HIV prevalence in Nigeria was 3.1% in 2007. Nigeria ranks third most affected by HIV/AIDS globally, after South Africa and India. Nigeria is among the 15 focus countries, which collectively represent 50% of HIV infections worldwide. Although the HIV prevalence of approximately 3.1% (UNAIDS, 2004, 2008 and 2010) appears relatively low compared with other countries in sub-Saharan Africa, it nevertheless translates into about 2.6 million people infected with HIV in Nigeria. Out of these, approximately 750,000 require antiretroviral treatment and this number is expected to double in the next 5 years. In 2007, it was estimated that 200,000 people were receiving antiretroviral therapy (ART) from various providers in the country representing about 27% of all the people who need the treatment. Between 2005 and 2009, the AIDS related deaths fell from 220,000 to 170,000 while those orphaned as a result rose from 930,000 in 2005 to 1.2 million orphans in 2009. Estimates also show a cumulative death of 1.45 million people (FMOH, 2007).

BURDEN OF THE DISEASE IN NIGERIA

HIV/AIDS, malaria and tuberculosis, along with other infectious diseases, still predominate in Nigeria and will do so for the foreseeable future (Tewfik et al., 2010).

The high burden of the disease with its associated morbidity and mortality despite the concerted efforts of the Federal Government of Nigeria and its international and local partners to combat the disease, it continues to constitute a major public health concern for the country (FMOH, 2007).

The epidemic has further weakened and threatened to overwhelm the Nigerian health care system, increased the number of orphans and increased the cost of achieving set developmental goals by decreasing the size of the workforce affecting as it does, mainly adults in their most productive years of life (15-60 years). The high manpower-intensive sectors of the economy are most affected; in Nigeria this includes the agricultural, educational and health

sectors as well as the rural economy. In summary, the impact of HIV/AIDS on Nigeria's social fabric and on its economic development and well-being country to be pervasive and, unless controlled, will continue to undermine the quality of life of Nigerians (FMOH, 2007).

CURRENT INTERVENTION PROGRAMMES AT INTERNATIONAL LEVEL

The 2009 epidemic update revealed slow but steady progress on averting HIV-related deaths, disease progression, and new HIV infections, progress that resulted from expanded access to antiretroviral therapy, antiretroviral prophylaxis, and safe infant-feeding interventions (WHO, 2010).

The revised recommendation for antiretroviral therapy (ART) will include an earlier start to treatment for all HIV-infected individuals with a CD4-cell count of 350/mm^3 or less and those with advanced HIV clinical disease, active tuberculosis, or active chronic hepatitis B irrespective of CD4-cell count. They are based on evidence of both individual and public health benefits of starting treatment earlier (WHO, 2010). However, WHO recommends that nutritional care and support with macro/micronutrients must be started at the early stages of the infection in order to prevent weight loss and malnutrition (Piwoz and Preble, 2000; WHO, 2009).

CURRENT INTERVENTION PROGRAMS IN NIGERIA

In response to the challenge of reversal in the gains in development and life expectancy and the fact that approximately 750,000 PLWHA were estimated to be in need of ARV treatment (FMOH, 2007), the Federal Government of Nigeria, as part of its care and support strategies initiated the National Antiretroviral Drug Access Programme in 2002 in 25 sites across the country. The goal was to provide access to affordable antiretroviral (ARV) drugs thereby improving the health and quality of life of PLWHA in Nigeria in order for them to meaningfully contribute to the sustainable development of the Nation.

Furthermore, the Nigerian Government, fully committed to increasing access to treatment, developed a scale-up plan targeting treatment for 1 million PLWHAs by 2009 and universal

access by 2010. Appreciable progress has been made and there are over 200 ART sites nationwide supported by funds provided by the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM), the World Bank and the US President's Emergency Plan for AIDS Relief (PEPFAR). In addition, Faith based and private organizations are also providing services.

JUSTIFICATION AND RATIONALE OF THE NEED OF PUBLIC HEALTH NUTRITION INTERVENTION PROGRAMME IN NIGERIA

HIV/AIDS scourge has had a devastating impact on health, nutrition, food security and overall socioeconomic development in countries that have been greatly affected by the disease. There is an urgent need for renewed focus on and use of resources for nutrition as a fundamental part of the comprehensive package of care at the country level.

Action and investment to improve the nutrition of PLWHA should be based on sound scientific evidence, local resources, and programmatic and clinical experience with the prevention, treatment, and management of the disease and related infections. Although there are gaps in scientific knowledge, much can and should be done to improve the health, nutrition and quality of care for PLWHA and their families and communities.

In West Africa, there are many macronutrients in commonly available food sources which may contain antioxidants and relevant essential vitamins and minerals. Such food sources need to be appropriately analyzed *vis-a-vis* their potentials for use in the management of HIV/AIDS.

ARVs have been shown to reverse under-nutrition in HIV/AIDS but are usually used at the later stages of the disease when the patients are moribund (Boon et al., 2006; Kumar and Clark, 2005). Thus, presently, 75% of Nigerians infected with HIV do not require ART, but nutritional assistance to maintain the immune system, sustain healthy levels of physical activity and for optimal quality of life. Incidentally, virtually all the HIV/AIDS programmes and interventions at the moment focus on the remaining 25% of HIV infected subjects in Nigeria. The implication of the reality on ground is that all the interventions at the moment are

grossly unable to cope with the treatment of those who require ARVs urgently.

ORIGINALITY OF THE PROPOSED CONCEPTUAL FRAMEWORK TO INTERVENE TO ATTENUATE HIV PROGRESSION TO AIDS

Development of 'HIVmeal'

Under-nutrition and micronutrient deficiency remains significant contributors to morbidity and mortality in developing countries (Amuna, Zotor & Tewfik, 2004; FAO/WHO, 2002) and in economic terms, remain a major challenge. Food-based approaches need to be innovative, culturally relevant, reliable and requiring low-tech approaches in order to assure compliance, sustainability and cost-effectiveness. It is possible to improve the nutritive value of local foods through simple but scientific combinations of food ingredient in form of food multimixes (FMM). A FMM may be defined as a blend of locally available, affordable, culturally acceptable and commonly consumed foodstuffs mixed proportionately, drawing on the 'nutrient strengths' of each component of the mix in order to optimize the nutritive value of the end-product without the need for fortification (Amuna, Zotor &Tewfik, 2004).

Hypothesis of the conceptual framework

Selected micro and macronutrients can delay the progression of HIV to AID by improving the CD4 counts and reducing the viral load in People Living with HIV with a CD4 count above 200/mm^3.

STUDY DESIGN AND METHODOLOGY

Description of study setting:

The setting of the study will be State House Medical Centre - SHMC, Abuja, Nigeria. SHMC is a secondary health institution recognized by the Federal Government of Nigeria for the care and management of PLWH. Presently, the institution is involved in intervention programmes such as Voluntary Counseling and Testing (VCT), Prevention of Mother to Child Transmission of HIV (PMTCT), Pediatric Antiretroviral Treatment and Adult Antiretroviral Treatment.

Laboratory analysis of macronutrients will be carried out in London at University of Westminster and micronutrient analysis at London Metropolitan University. CD4 count, viral load assessments and clinical trial will be undertaken at Department of laboratory medicine, State House Medical Centre Abuja (SHMCA) Nigeria, one of the centres in Nigeria recognized for the care and management of HIV/AIDS patients.

Target population:

Recruitment of study participants will be done by the researcher while the sample collection, CD4 count, viral load assessment and other laboratory investigations will be performed by a trained laboratory scientist in SHMCA. The analysis of micro and macronutrients as well as optimization of HIVmeal will be carried out by the researcher in London.

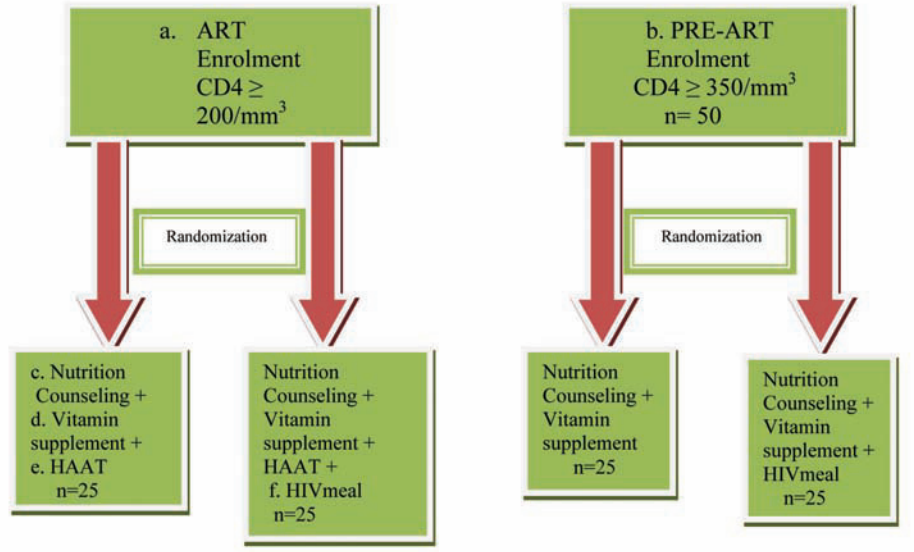
Eligible PLWH will be recruited, and given the right to decline participation without jeopardizing receipt of care at the State House Medical Centre, Abuja. Prior intervention, 'consent form' will be signed and 'project information' sheet will be given and explained to all participants.

Once enrolled, participants will be subjected to an "interview questionnaire", which include some variables; *demographic information, specific questions on lifestyle, health habits and nutritional practices.* Furthermore, participants shall be grouped into four groups according to the study design. Nutrition counseling, Highly Active Antiretroviral Therapy *(provided as standard mode of treatment for PLWH by the State House Medical Centre),* vitamin supplements, specific micro and macro-nutrient combination will be administered to the groups' accordingly.

At the onset of the research, one hundred (100) participants will be recruited for the pilot study. Thereafter, a larger scale intervention that will recruit two hundred (200) participants will follow to determine the impact of the research study on a larger population. The justification of the sample size for the pilot study is based on the 95% confidence interval and a precision limit of 0.05 for the study.

Design (pilot)

Figure 1



Step 2. Assessment of all the groups at month zero (0) i.e. the beginning of the study

Step 3. Re-assessment of all the groups at three (3) months and six (6) months.

Step 4. Comparison of results obtained.

1. ART (Anti-Retroviral Therapy) enrolment are People Living With HIV (PLWH) and are on HAART with a CD4 count value of ≥ 200/mm^3 according to WHO classification and HIV treatment guideline in Nigeria. These patients are HIV patients but not full blown AIDS patients

2. Pre-ART enrolment are People Living With HIV (PLWH) but are not on HAART yet because their CD4 count value is ≥ 350/mm^3 according to WHO classification and HIV treatment guideline in Nigeria

3. Nutrition Counseling is provided as a routine service to

People Living With HIV/ AIDS (PLWH) receiving care at the SHMCA

4. Vitamin supplements are provided, prescribed and dispensed at a dose of one capsule daily or one capsule twice daily to PLWH receiving care at the SHMCA. The composition of the vitamin supplement is vitamin A 3333 IU, vitamin B1 4.5mg, vitamin B2 5.1mg, vitamin B6 6mg, vitamin B12 6µg, vitamin C 180mg, vitamin D3 200 IU, vitamin E 10mg, Biotin 0.3mg, Pantothenic Acid 21mg, Folic Acid 0.2mg, Nicotinamide 57mg, Calcium 50mg, Magnesium 40mg, Phosphorus 50mg, Copper 0.4mg, Iron3.6mg, Manganese 0.5mg,Zinc 3mg, Chromium 10µg

5. HAART (Highly Active Anti-Retroviral Therapy) are HIV medicines provided, prescribed and dispensed (according to the clinical status of the patient) to PLWH receiving treatment at SHMCA

6. HIVmeal is a combination micro and macro-nutrients, carefully selected from locally available food in Abuja Nigeria, analyzed and formulated into a 100g pack for daily consumption by study participants. The composition of HIVmeal is Soya beans (Glycine max), millet (Pennisetum typhoides), Guinea corn (Sorghum), Rice (Oryza sativa), Carrot (Daucus carota), Moringa leaves (Moringa oleifera) Efo (Amaranthus hybridus) Bitter leaf (Vernonia amygdalina), Ugu leaf (Telfairia occidentalis), and Ewedu leaf (Corchorus walcottii).

RESEARCH VARIABLES

Anthropometric measurements *(e.g. mid-upper arm circumference (MUAC) body mass index, skin fold measurement, waist circumference),* clinical investigations *(e.g. review of dietary history, dietary intake, blood pressure measurement)* and biomedical indices *(e.g. blood glucose level, lipid profile, CD4 count, viral load)* will be conducted at the commencement of the study, third and sixth months of the pilot and larger scale studies respectively.

EXPECTED OUTCOMES AND OUTPUTS

The outcome of the study will have direct effect on 90% of HIV infected subjects in West Africa *vis-à-vis* slowing down /eliminating the progression of HIV to

11.0 Conceptual framework

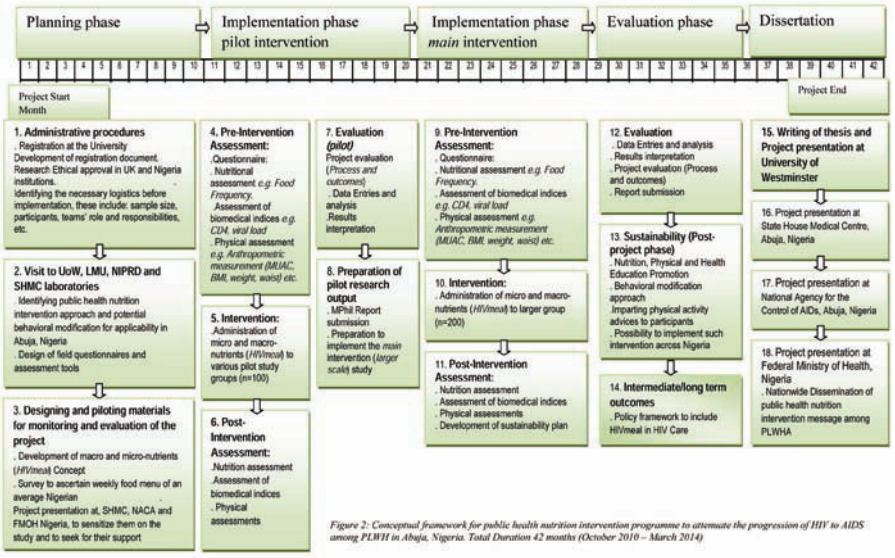


Figure 2: Conceptual framework for public health nutrition intervention programme to attenuate the progression of HIV to AIDS among PLWH in Abuja, Nigeria. Total Duration 42 months (October 2010 – March 2014)

AIDS through Nutrition and HIV Integration and service delivery. The programme will lead from research to action (products).

BIOGRAPHY

Dr. Abraham Amlogu is a Consultant Clinical Pharmacist in State House Medical Centre, Aso Rock, Abuja, Nigeria and a PhD Public Health Nutrition research student in the Department of Human and Health Sciences, University of Westminster, London. He holds a Bachelor of Pharmacy degree, Master degree in Public Administration and a Doctor of Pharmacy degree. He is a Fellow, West African Postgraduate College of Pharmacists, a Fellow of Hachioji Pharmaceutical Centre, Japan and a Fellow of the Royal Society of Tropical Medicine and Hygiene, London. His field of research interest is monitoring of clinical use of pharmaceutical and nutraceutical agents against HIV/AIDS, malaria and other infectious diseases. His current research is ''assessing the effectiveness of public health nutrition intervention programme to attenuate the progression of HIV to AIDS among people living with HIV in Abuja, Nigeria''.

Dr. Sundus Tewfik is the course leader for Herbal medicinal sciences at Faculty of Life Sciences, School of Human Sciences,

London Metropolitan University. As a Pharmaceutical scientist she lectures on conventional and herbal pharmacology. She is qualified as a Biologist. Sundus holds Masters in Applied Microbiology and PhD in Pharmacognosy from University of Westminster. She is registered as 'Biomedical Scientist' at the Health Professional Council (HPC) - UK as well as fellow of the Institute of Biomedical Science. Additionally, Sundus is 'Chartered Scientist' at the Science Council, UK. Sundus has carried out numerous research projects on various aspects of herbal medicine; biochemical analyses, antimicrobial testing, isolation/identification of 'biologically active' components and quality control of herbal products and botanical supplements. Sundus' current research interests include the use of phytochemicals in human nutrition domain, focusing on how functional foods and nutraceuticals influence health outcomes and health risks to individuals and communities.

Professor Charles Wambebe is a Professor of Pharmacology and presently the Chair, Product Research and Development for Africa. He is also the President, International Biomedical Research for Africa. Charles Wambebe pioneered the research and development of the first Nigerian HIV-1 candidate vaccine (1999-2002). Involved collaboration with Centers for Disease Control and Prevention, Atlanta and Institute of Human Virology, Baltimore. He also pioneered the research and development of plant extract (CONAVIL) for the management of HIV/AIDS. Pilot clinical trials have been undertaken with promising data (1999-2002). Controlled comparative clinical trial has been planned and awaiting funding. He developed the Draft Nigerian National HIV Vaccine Plan with support from UNAIDS/ Geneva, 2000. Professor Wambebe is a consultant to the World Health Organization (WHO) and one amongst his numerous awards is the International Directory of Distinguished Leadership, First Edition, 1986. The American Biographical Institute, Raleigh, North Caroline, U.S.A.

Kate Godden is a lecturer in the School of Life Sciences, University of Westminster. She is also a food security and nutrition adviser who has specialized in the humanitarian and development sectors since 1990. Her primary focus is on under- nutrition. She has an MSc from the London

School of Hygiene & Tropical Medicine, and is registered with the UK Nutrition Society as a Public Health Nutritionist. Her teaching inputs are to the postgraduate programme running modules in Food Security; Nutrition & Programme Planning for the MSc International Public Health Nutrition. Additionally she leads an intensive stand alone short course; and Nutrition in Emergencies. Additionally she has worked in the UK and in many countries internationally carrying out consultancy work for DfiD, UN agencies and NGO's largely conducting needs assessment, reviewing proposals and running independent evaluations.

Dr. Ihab Tewfik is the Course Leader for BSc. (Hons.) Human Nutrition, Department of Human and Health Sciences, University of Westminster. Besides his biochemistry background, Ihab holds Master and Doctorate in Public Health, Nutrition department, University of Alexandria in addition to PhD from London South Bank University. Ihab is a Registered Practitioner in Higher Education - UK, as well as Fellow of the Royal Society of Public Health (FRSPH). Dr Tewfik has carried out 11 research projects for UNICEF-UN in aspects of public health nutrition & food safety and has published a number of publications in refereed journals and international conferences. As a Registered Public Health Nutritionist at the Nutrition Society, Ihab has organized several international conferences, workshops, CPD and short training courses on Nutrition related diseases and Public Health. Ihab is member of the Editorial Advisory Board of various international scientific journals.

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