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A multidisciplinary journal for publication of medical and biomedical research findings on issues pertinent to improving family health and related issues of public health

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INFORMATION

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March 2021: ISSN: 2072 – 1625 VOLUME 21, No. 2

TABLE OF CONTENTS **Page #**

COVID-19 SITUATION REPORT: POHNPEI STATE, FEDERATED STATES OF MICRONESIA

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ABSTRACT:
The Federated States of Micronesia (FSM) instituted travel ban for in bound passengers coming into the country since March 2020 as a measure of preventing COVID-19 entering the country. The FSM was COVID-19 free until January 2021 when the country reported its first imported case. COVID-19 vaccination has commenced and is ongoing. This brief report presents a situation update and summary of the present situation in the country.

Keywords: Federated States of Micronesia, Pohnpei State, COVID-19, coronavirus pandemic.

INTRODUCTION:

On March 15 2020 Governor of Guam Lou Guerrero announced that three individuals on Guam were tested positive for COVID-19. Two of the cases flew in from Manila, Philippines on a United Flight on the morning of March 2nd 2020 and one of the cases had no travel history. In response to the positive cases identified in Guam, the government of the Federated States of Micronesia (FSM) declared a public health emergency and instituted travel restrictions following the country's COVID-19 contingency plan [1]. The FSM is accessible by plane via Guam or via Port Moresby, Papua New Guinea. It has been nearly 12 months since travel ban was introduced by the government of FSM. No inbound passengers are allowed into FSM. Only outbound passengers are permitted. United Airlines is the only airline company currently flying into the FSM moving cargo into and out of the FSM. This brief report will provide some update on the COVID-19 situation in the State of Pohnpei, FSM. Pohnpei is one of four states that constitute FSM. The other three states are Chuuk, Kosrae and Yap.

Response and preparedness since February 2020: Travel restrictions have been in place since March 2020 [1]. In October 2020 the Pohnpei State government extended the restrictions to February 2021 [2]. This means that no person will be granted entry into Pohnpei until February 2021 when this restriction will be reviewed by the state government. Stakeholder engagement is ongoing and the FSM government is working with the World Health

Organization (WHO) and United States Center for Disease Control (CDC) providing situation report to the department of health for ongoing preparations [3, 4]. Public awareness, surveillance and testing are ongoing [3, 4]. The government of China donated 10 self contained isolation units that have been installed at a COVID-19 designated treatment site and will be used for treatment and monitoring of any person that is tested positive for COVID-19 [5].

Challenges: Pohnpei State does not have the infrastructure and finance to mount an adequate response to COVID-19. Therefore FSM government has been supported by the United States government to help prepare and improve existing infrastructure. There are 18 doctors working at the state hospital, 11 of whom are above 40 years of age so these physicians are high risk for COVID-19. The high burden of non-communicable diseases such as diabetes, hypertension and chronic obstructive airway diseases in FSM also pose a major threat to the population.

How will Pohnpei deal with COVID-19 in 2021? The strategy for Pohnpei is travel restrictions and vaccination. This decision has been influenced by the state's lack of infrastructure and human resource capacity to deal with COVID-19. The FSM government started its COVID-19 vaccination campaign on December 31st 2020 when it received the first 1600 doses of the Moderna Vaccine [6] and is still continuing. The priority groups are healthcare workers, frontline border and security personal and high risk segments of the population such as those with pre-existing chronic medical conditions (e.g. diabetes, hypertension, chronic lung diseases). The FSM recorded its first case of COVID-19 on January 7th 2021 [7]. The case was a crew of a sea vessel returning from the Philippines. However, upon further testing and investigation, the case was deemed an historical case and WHO declared the FSM COVID-19 free [8]. There have been no other positive cases. Surveillance and other public health measures for COVID-19 are ongoing.

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COVID-19 PANDEMIC SITUATION ANALYSIS FOR BRUNEI DARUSSALAM - PERSPECTIVES FROM THE FRONT LINE, GERIATRIC MEDICINE AND MENTAL HEALTH

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Running Title: *COVID-19 situation in Brunei*

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ABSTRACT:
This paper outlines the COVID-19 pandemic situation analysis for Brunei Darussalam, covering perspectives from the front-line, geriatric medicine and mental health. This content was presented at a webinar entitled "COVID-19 and older persons in Brunei Darussalam" held on 9th October 2020. Brunei's response to COVID-19 and flattening the curve, COVID-19 and older people in Brunei Darussalam and mental health aspects among older people during the COVID-19 pandemic are discussed. The impact of COVID-19 on geriatric medicine services locally, challenges for older people requiring medical input and recommendations for older people during the pandemic are described. The impact of the pandemic on psychiatry services and to people's mental health and well-being are also discussed.

Keywords: Aged; COVID-19; mental health; Pandemic

INTRODUCTION:

The content of this situation analysis was presented in a webinar held in Brunei Darussalam on 9th October 2020. This was organised by the Shield Our Seniors (SOS) team, a group of five third year undergraduate medical students from the Institute of Health Sciences, Universiti Brunei Darussalam. The topics discussed were as follows: Brunei's response to COVID-19 and flattening the curve; COVID-19 and older people in Brunei Darussalam and Mental health aspects among older people during the COVID-19 pandemic. These were presented by a front-line physician, Consultant Geriatrician and a senior Psychiatry medical officer respectively. The 'COVID-19 and older persons in Brunei Darussalam' webinar is available online. [1]

Brunei's response to COVID-19 and flattening the curve:

When the first COVID-19 cases surfaced from Wuhan in December 2019, local Brunei Infectious Disease specialists raised concerns regarding the potential international implications of this novel coronavirus. Once the pandemic took off from the epicentre, meetings had already started to plan logistical issues, such as initial response and training of healthcare professionals regarding infection control and use of personal protective equipment (PPE). The seriousness of the situation led to Wuhan being in lockdown, requiring repatriation of two Brunei citizens with a retrieval team and a chartered flight.

The first local case in Brunei was diagnosed on 9th March 2020, which originated from Kuala Lumpur at a super-spreader event [2]. There was a rapid emergence of new cases, including local clusters identified. The first local death due to COVID-19 complications was a 64-year-old man, who passed away on 28th March 2020 [3].

The national response was swift - travel regulations were tightened, with special permission required for entry and exit. As rigorous contact tracing was necessary to control the infection, the “Bru-Health” app was developed and implemented early. It was mandated that members of the public use the app to fill out a symptom checklist daily and scan themselves in and out of places. Brunei also has one of the highest rates of testing for its population. The sports complex in RIPAS Hospital was converted into a COVID-19 screening centre, which functioned 24 hours daily, 7 days a week (currently it opens 7am to 10pm daily). Staff members were asked to assist with testing among the other frontline tasks. The new testing lab was built at Sumbiling to increase testing capacity and improve turnaround time. COVID-19 positive patients were initially admitted into the isolation centre, previously mainly used for tuberculosis patients. A new National Isolation Centre was also built in Tutong district to accommodate the number of patients requiring isolation [4].

Social distancing measures were enforced, including closure of places of worship such as mosques and churches. This was significant for Brunei as a predominantly Muslim country, and people were unable to congregate for prayers. Schools, shops and dine-in restaurants were closed temporarily, requiring people to adjust to online approaches for learning and shopping [5]. Although this was a difficult time for businesses, resilience and innovation meant new online business opportunities and delivery services developed in the country.

The leadership shown by the government led by his majesty the Sultan of Brunei enabled the rapid multi-sectorial response to manage the pandemic. The spiritual approach was embraced, where the state mufti (scholar) gave a fatwa, or legal pronouncement in March 2020, providing spiritual guidance during the pandemic. The Ministry of Health was proactive in disseminating information on measures to curb spread of the virus, such as social distancing and hand hygiene. There was initial

daily media coverage of the pandemic, also screened via social media to promote transparency and correct false information or rumours [6].

While there was an initial adjustment phase, the public were overall compliant to regulations and social restrictions. There was also unity and support for front-liners, with volunteers stepping forward to offer assistance when required. Various businesses and organisations (government and non-government) contributed resources and encouragement for front-liners during this difficult time. International aid was also received from other countries, who contributed expertise, resources and PPE supplies. The multinational collaboration was reciprocal with Brunei assisting people to return home by coordinating and organising flights.

These actions led to flattening of the curve by April 2020, with occasional spikes of imported cases. As of 9th October 2020, there were 154 days without new local cases, 146 COVID-19 cases and 3 deaths in the country. The main challenge now is the uncertainty, where the country must remain vigilant and united to manage the pandemic situation.

***COVID-19 and older people in Brunei Darussalam*:**

Older people have a higher risk of mortality from COVID-19 infections. Older people also tend to have more comorbidities. Cardiovascular disease, diabetes, chronic respiratory disease, hypertension and cancer are associated with mortality from COVID-19 infections, hence older people are a high risk group during this pandemic [7, 8].

In Brunei, the pandemic had a significant impact on geriatrics and palliative services. Two-thirds of the specialists were responsible for frontline initiatives, while staff including doctors, nurses and allied health professionals were pulled for COVID-19 related tasks, such as covering the National Isolation centre, isolation wards, swabbing and contact tracing duties. All non-urgent and outpatient services were deferred or cancelled, including a weekly dementia support group. Nurse-led home visits were cancelled due to concerns regarding infection risk. Initially, essential reviews were seen and brought forward, as the imminent interruption to services was predicted. Phone-call follow-ups were made explaining the situation, and medication prescriptions were renewed by proxy. The unit also reviewed urgent clinic cases and renewed prescriptions for all the Tutong clinics within a fortnight since the first local case, as Tutong physicians took charge of the National Isolation Centre. The service also had to move offices, as adjoining wards sharing the same ventilation were earmarked for potential isolation wards for the hospital.

Visitor restrictions were mandatory, limiting availability of family assistance for admitted patients. There was also an incident where a geriatrics patient was visited by a relative, while having symptoms and a positive COVID-19 test two days later. When this was identified through

contact tracing, the geriatrics team and ward staff in contact with this patient were instructed to self-isolate until swab results from the patient came back negative. This stand-down period had significant implications for the clinical service.

There were additional challenges in providing geriatrics and palliative services. Patients presenting with influenza-like illnesses and community acquired pneumonia were screened and admitted to isolation wards while awaiting swab results. This delayed input from the primary team and allied health professionals. PPE had to be worn to see these patients for infection prevention and control, with an initial shortage of supplies [9]. It was occasionally difficult to decide the risk-benefit of admitting patients to hospital, which may expose them to hospital infections or COVID-19. There were frequent updates in workflow protocols and Standard Operating Procedures, particularly at the start of the pandemic. The staff had concerns regarding their safety from occupational exposure to the virus resulting in increased stress and anxiety.

When the first local case was announced, there was an initial reluctance for patients to come into hospital. After a low admission rate for approximately two weeks, there was a noticeable surge in geriatric admissions. Patients were generally frail or dependent older patients who required hospitalisation due to limited community geriatrics services, or older patients who delayed seeking treatment from fear of coming to hospital during the pandemic. These patients were severely unwell, sustained multiple complications and required a longer length of stay for treatment.

This pandemic caused several complications for older inpatients. Delirium is common for older people who are unwell with cognitive impairment. This was often seen in patients stepped down from isolation wards, particularly at the initial phase with a three-day turnaround time for swab results. Delirium was exacerbated by the limited personal contact, lack of orientation and frequent interruptions to rest from routine monitoring procedures. It is difficult to implement strategies to manage delirium in isolation wards, such as providing reorientation and assistance with mobility and toileting, ensuring hydration and nutrition, and availability of hearing aids and glasses [10].

There was also an increase in older people sustaining pressure injuries. This was likely due to limited caregiving by family with enforced social distancing measures and lack of monitoring due to suspended nursing home-visits. The first three months saw nine patients admitted with Stage 4 sacral pressure injuries complicated by osteomyelitis. Two-thirds passed away in hospital, and all required daily intensive nursing input to debride and manage wounds. An emphasis on pressure injury prevention and caregiver education regarding as regular turns, lifting approaches to avoid shearing and considering ripple mattresses is necessary to reduce this risk [11].

There are several recommendations for older people during the pandemic due to the high risk of complications with COVID-19. Infection prevention and control measures such as social distancing, hand hygiene and mask wearing is recommended. As the virus can be transmitted via fomites, it is important to disinfect and clean furniture surfaces often [12]. It is important to maintain health with adequate nutrition, hydration and sleep. Physical activity should be maintained as possible. It is crucial to know who and how to call for medical advice and renewing medications. Advance care planning is encouraged, where people discuss their care preferences and who should be contacted if decisions should be made on their behalf [13].

From the service perspective, there is a need to help older people self-manage their medical conditions and raise awareness of healthy ageing measures to improve functional reserve. Educational initiatives are planned to improve delirium management in isolation wards and pressure injury prevention among caregivers. Video consultations were also introduced for virtual patient reviews to ensure follow-up and continuity of care during the pandemic.

Mental health aspects among older people during the COVID-19 pandemic:

Mental health is defined as a state of well-being, where a person realizes their own abilities, is able to cope with normal stresses of life, work productively and contribute to society. It is more than just the absence of mental disorders or disabilities, and affects how people think, feel and behave [14].

Due to the global threat, the World Health Organisation (WHO) recommended strict social isolation to reduce mortality from COVID-19. The pandemic and such advice was associated with increased fear, panic and apprehension. Advanced age is a predisposing factor for physical and mental health issues. Older people are also prone to social isolation and loneliness, which worsened with social distancing measures [15]. Family members reduced visiting to reduce exposing loved ones to potential infections. These strict lockdowns and limited social interaction can precipitate mood and anxiety issues, further compounded by a near-constant stream of COVID-19 pandemic information such as infection and mortality rates via the news and social media [12]. Effects on physical activity, sleep, poor access to basic needs such as food and medications can worsen mental health, or cause relapses in those with predisposing mental health conditions. For older people with cognitive impairment, it may be difficult to comply with social distancing and infection control measures, while wandering, irritability and psychotic symptoms can cause panic among family and caregivers [16].

The Psychiatry Department followed Ministry of Health guidelines for patients, visitors and healthcare professionals. This included signing into the “Bru-Health” app, temperature screening and hand hygiene measures before

entering the facilities. Patient's visitors were limited to 15 minutes, with only one visitor permitted at a time. Patients from the Old Age Clinic were rescheduled if stable, with options given for walk-in consultations if needed. Community Psychiatry patients had visits withheld and medication prescriptions were renewed automatically. Psychiatry doctors had to be dispatched to the National Isolation Centre, as quarantined patients required input for mental health issues. While pre-existing patient consultations remained stable, there was an increase in new patients, especially anxiety requiring psychological input.

There are several recommendations to maintain mental health for older people during the pandemic. The holistic involvement of family members and caregivers is essential, with a need for increased sensitivity to mental health. Social connectedness and support is necessary, which can be facilitated through regular phone-calls and technology, such as "WhatsApp". It is beneficial for older people to participate in enriching activities, learn new things and perform self-help activities such as meditation, relaxation and exercise. Reducing digital screen time may be helpful to prevent misinformation and panic, while vivid data and unnecessary statistics are better avoided. Family support is needed more than ever during this difficult time, as older people and their caregivers may be negatively impacted by social isolation. Autonomy, respect and dignity for all individuals should be preserved. While taking care of older people is important, there is a need for them to maintain active involvement in decision making [13]. While social distancing is important for physical health, social connectedness and mental health should also be maintained. There should also be increased awareness and sensitivity to the needs of those with pre-existing mental health disorders such as dementia, depression and anxiety during this time [17].

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IMPACT OF COVID – 19 ON NUTRITIONAL STATUS OF PEOPLE: SITUATION ANALYSIS IN FIJI

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ABSTRACT:
Corona Virus Disease 2019 (COVID – 19) has affected Pacific Island Countries (PICs), despite the small number of cases recorded so far. To curb the effects of COVID-19, various countries imposed varying degrees of lockdowns. This triggered rapid changes in the food environment and affected diverse dietary habits in the population, as well as job losses. As a result of COVID-19, unhealthy food choices have led to changes in the dietary habits of some people in various communities. The aims of this situation analysis report was to review and explore the Impact of COVID – 19 on Fiji's food security and nutritional status of the people; and also establish how it may contribute towards the rise of Non communicable diseases (NCD) in the country. The literature search was done using Medline, Embase, Scopus, and Proquest databases, and relevant keywords were applied to find studies which have been conducted in the field of COVID – 19 specifically looking at food security and nutrition in the Pacific and in Fiji. In addition, local media reports and press releases from Fiji's Ministry of Health and Medical Services and Ministry of Education, Heritage and Arts were also used. Most of the studies pertaining to the topic, published in 2020 in English language were reviewed and the main themes were identified. Our findings showed that COVID – 19 impacted Fiji's food and nutritional status via: food insecurity, malnutrition in children, and rise in NCD. This report concluded that the COVID – 19 pandemic has impacted Fiji's food and nutritional status. We propose that relevant research needs to be done to explore how the diet of Fijians will be affected as the pandemic worsens. Such a research if conducted will provide inputs to better prepare Fiji in terms of food system security, should another pandemic occur in future.

Keywords: Food Security, Malnutrition, Non-communicable Diseases, COVID-19

INTRODUCTION:

In January 2020, the Chinese Centre for Disease Control and Prevention (CCDCP) announced that a coronavirus, Severe Acute Respiratory Syndrome (SARS)-CoV-2, was the causative pathogen in a series of novel pneumonia cases in Wuhan, Hubei Province. The virus was later named Coronavirus virus disease of 2019 (COVID-19) by the World Health Organization (WHO) [1]. Within a few months, COVID-19 had spread globally. The WHO declared COVID-19 as a controllable pandemic disease on the 11th of March 2020 [2-3]. COVID-19 is currently one of the leading causes of death in most countries, with prevalence rates exceeding those of diabetes and other diet-related Non-communicable Diseases (NCDs) [4]. As of 21st January 2021, 96.4 million cases of COVID – 19 have been recorded globally, with 2.07 million deaths [5]. Although the mortality associated with COVID-19 is low, it has a high spreading potential [6], and this characteristic of the virus has influenced every aspect of life [7]. In order to mitigate the spread of this virus, multinational and multi-continental measures have been introduced, such as: reducing non – essential services, social gatherings, quarantine and many other actions [8]. Although effective in controlling the spread of this virus, these methods have triggered rapid changes in the food environment and affected diverse dietary habits in the population [9]. Furthermore, many individuals have lost their source of income due to COVID – 19 related movement restrictions, and do not have any access to social protection to properly support them during this crisis [10]. Ultimately, further vulnerabilities to food insecurity, malnutrition, and obesity imposed by the COVID-19 pandemic are anticipated. These are likely to magnify inequalities in healthy living behaviors in a world that operates with an already strained food security environment, perpetuating a viscous synergy of complex but preventable nutrition conditions that may lead to the creation of diet-related NCDs [11].

The Pacific region is not immune to the current global scenario, and Pacific Island Countries (PICs) are striving to ensure that COVID – 19 does not evolve into a health crisis. Some measures have been adopted to mitigate the risk, such as, restriction of movement of people within and among countries have had severe impacts on tourism, international trade and, remittance [12]. Furthermore, the COVID-19 pandemic has exposed the vulnerability of the Pacific food system to externalities and has had far-reaching impacts; despite the small number of COVID-19 cases recorded thus far [12]. Fiji for instance, recorded its first case of COVID – 19 on 19th March, 2020, and thereafter implemented: border restriction to high risk countries, lockdown, and self – quarantine measures [13]. On 5th June 2020, Fiji declared itself COVID free, after clearing its last active COVID – 19 patients [14]. Currently, Fiji is classified as a COVID contained nation with 4 border quarantined cases [15]. Although, the

people of Fiji are safe from any immediate threat of COVID - 19, the measures enacted to contain the virus have had substantial impact on the economy. This is because; Fiji is heavily reliant on income from tourism [16], which accounts for about 40% of its Gross Domestic Product (GDP) and approximately 37% (direct and indirect) of all employment [17]. As a consequence of tourism cessation, unemployment is rising [18], and other sectors that support tourism including agriculture, transportation, retail, lodging, food, and recreation, are also being affected [19]. Such ramifications pose a serious health concern, particularly the interplay between loss of incomes and the availability and affordability of local and imported foods [12].

The prevalence of diet – related NCD is particularly high in Fiji, with the 2011 STEP survey revealing that 1 in 3 Fijians are diagnosed with diabetes [20]. With loss of income, rising unemployment, and COVID – 19 measures in place, it is expected that the diet of Fijians may change, and this will have an impact on the incidence rate of NCDs.

Thus, this literature review aims to explore the impact of COVID- 19 pandemic on food security and nutritional status of the people especially children, and how it has contributed towards the rise of NCDs in Fiji.

METHODOLOGY:

This literature review focused on several aspects related to COVID – 19 and its impact on nutrition in Fiji. Four databases were used to search for publications on relevant studies: Medline, Embase, Scopus, and ProQuest. The keywords used included: (Factors OR Conditions OR Component) AND (COVID-19* OR “Coronavirus”) AND (“Nutrition” OR “Diet”), AND (“Fiji” OR “Pacific”). Additionally, local media reports and press release statements by the Fiji’s Ministry of Health and Medical Services (MoHMSs) and Ministry of Education, Heritage and Arts (MoEHA) were also used. The focus of the search was studies and media reports published in 2020 in English language. The titles of all the studies were scanned by two independent researchers and those not relevant were excluded. The abstracts of the remaining studies were reviewed and 17 full text articles that met the study inclusion criteria were printed for future review and to formulate the themes that are discussed below.

FINDINGS:

This study found three themes that determine the impact of COVID – 19 on nutrition in Fiji these are: food insecurity, malnutrition in children and increase in NCD rate. These themes are presented and discussed below:

***Theme 1: Food insecurity*:**

A person is food-insecure when they lack physical, social, and economic access to enough safe and nutritious food to meet their nutritional needs and food preferences to lead an active and healthy lifestyle [21]. The COVID-

19 pandemic is undermining efforts to achieve the sustainable development goals (SDG) 2 which is “Zero Hunger” [22]. Already, before the pandemic, according to the latest State of Food Security and Nutrition report, about two billion people faced food insecurity at the moderate or severe level [22].

The Pacific region, characterized by a strong dependence on tourism revenues has suffered immensely from border closures and lockdowns, with knock-on effects for overall economic activity, supply chain disruptions and job losses. Dampened economic activity and consumer spending has serious repercussions on the development outcomes of PICs and their ability to achieve the SDGs [23].

The Food and Agriculture Organization (FAO), mention that imported foods make up half of a person's food intake in many Pacific Small Island Developing States (SIDSs) [23]. The FAO further predicts that if the pandemic were to continue then the regions food systems would be immensely affected because of supply chains both globally and local. Pacific SIDS rely on cargo shipment for food imports, and the shipping industry has been experiencing halted movements due to port closures or gaining access to ports with projections that this impact can be long lasting [23]. Furthermore, food prices have also been affected as in Fiji, it was seen that after the lockdown in Fiji's capital, Suva, the costs of the most consumed vegetables increased between 11 to 36 percent, in some cases up to 75 percent [23]. This may have had great impact on the nutrition of many people, because they would not be able to feed their families. A study conducted by Kent et al., [24] looking at the prevalence and socio-demographic predictors of food insecurity in Australia during the COVID19 Pandemic. They reported that between late April and early June 2020, a time when widespread social distancing restrictions were in place, more than 1 in 4 (26%) respondents had experienced food insecurity to some degree. Alarmingly, 14% of respondents experienced more severe food insecurity, which meant they were regularly going hungry and were unable to afford balanced meals over the previous month.

The study conducted by Wolfson and Leung [25] presented results from a national survey of low-income adults in the USA during COVID - 19 found that food-insecure adults were more likely to report that they had already been laid off and that their income would go down substantially. More than half (54%) of food secure adults reported they expected their income would remain the same compared to 23% of adults with very low food security. Food insecurity is associated with a range of negative health outcomes over the short and long term, including poor mental health outcomes such as depression, stress, and anxiety, poor diet quality, high rates of chronic diseases such as diabetes and obesity, and lower overall health status [25].

In the Pacific, the FAO reports that the rural population of the pacific tends to grow and

consume their own food, but the setback is that fertilizers and livestock feed are imported from other countries. Thus, due to COVID-19, the domestic production may be affected in the long run, which would also cause domestic prices of fruits and vegetables to increase causing more food insecurity issues [23].

Furthermore, at the recent world food day celebration in Fiji, the Minister for Health & Medical Services, mentioned, that the COVID-19 pandemic exposed the vulnerability of the island country's food systems with a potential impact on food security.

In mitigating this impact the minister stated that a new policy on food and nutrition security of Fiji had been developed and has been tabled in cabinet for approval to address the situation and cushion the effects of this pandemic on food insecurity [26].

***Theme 2: Malnutrition in children*:**

Malnutrition, in all its forms, includes under and over nutrition. Wasting, stunting, underweight, vitamin or mineral deficiencies are a result of under nutrition while the consequences of over nutrition include overweight, obesity, and diet related NCDs [27]. The unprecedented global, social, and economic crisis, triggered by the COVID-19 pandemic poses grave risks to the nutritional status and survival of young children in Low-income and Middle-income Countries (LMICs) [28]. The most damaging impact of the complex food insecurity phenomenon on individual health is the increased likelihood of malnutrition [28]. Nearly half of all deaths in children under 5 are attributable to under nutrition, which puts children at greater risk of dying from common infections which increases the frequency and severity of such infections, and delays recovery [29].

In Fiji, the Permanent Secretary for the Ministry of Health & Medical Services, in a press statement, stated that COVID-19 has affected the ability of many Fijians to access healthy food as COVID-19 had resulted in job losses, which has led to a reduction in peoples' ability to afford nutritional food. He also anticipates that diet related illness would be seen in hospitals as the pandemic worsens over the months and years [30]. According to FAO, the increase in the Prevalence of Under Nutrition (PoUN) is more pronounced for those countries with both high exposures to climate extremes and high levels of vulnerability. It also states that countries that highly dependent on agriculture show the highest level of PoUN [22].

Headey et al., [28] looked at the impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. Their particular concern was an expected increase in child malnutrition, including wasting, due to steep declines in household incomes, changes in the availability and affordability of nutritious foods, and interruptions to health, nutrition, and social protection services. During the COVID-19 pandemic, parents might use controlled feeding practices more often, because of higher levels of stress, fewer resources, and less access to food

(real or perceived) [31]. At the same time, malnutrition (including obesity) may increase vulnerability to COVID-19 patients [28].

According to a report by the High-Level Panel of Experts on Food Security and Nutrition (HLPE), 2020; Impacts of COVID-19 on food security and nutrition include: people's inability to earn a living and buy adequate food, maintain adequate nutrition for disease resistance, disruptions to food supply chains, a widening of inequality; disruptions to social protection programs, altered food environments and uneven food prices [32].

A cross-sectional, observational study by Adams et al., [31] used an online survey to measure parent-reported food security status, the home food environment, and parent feeding practices before the COVID-19 pandemic (retrospective report) and during the COVID-19 pandemic (at the time of survey completion). The authors ascertained that more than half (60.1%) of families experienced a decrease in income, of those that did, most had low food security (23.4%) or exceptionally low food security (42.5%). One third of the families reported to have an increase in unhealthy foods. Over 30 million children in the USA rely on the national school lunch program and school breakfast program, and meals and snacks from schools fulfill up to two-thirds of children's daily nutritional needs [33]. Without access to school meals (or a replacement meal provided by the school) during the pandemic, low-income families have the financial burden of providing additional meals for their children contributing to low intake of micronutrients such as iron, calcium and vitamins A and D which results in micronutrient deficiencies in children [33]. The Ministry of Education, Heritage and Arts (MoEHA) in Fiji had observed, that when schools resumed after the lockdown, many students did not bring lunch to school because their parents had suffered job losses due to the pandemic. The MoEHA stated that it would work with faith-based organizations in looking at how affected students could be assisted, so that their nutritional needs are met [34]. As a result, organization, such as, the Arya Pratinidhi Sabha of Fiji is assisting about 330 students at 35 of the Sabha run institutions with lunch as their parents are facing financial difficulties. The organization in a media report also mentioned that many students' parents were put on reduced working hours or were made redundant [35]. Furthermore, the south Indian body in Fiji, Sangam mapped out that close to 8000 students in their various schools would need to be provided with lunch when schools resumed.

This was again attributed to the fact that many parents of the students were left jobless and this had a direct effect on the students in meeting proper nutrition [36].

***Theme 3: Increase in NCD rate*:**

NCDs kill 41 million people each year, which is equivalent to 71% of all deaths globally [37]. Preliminary evidence indicates essential services have been directly and indirectly

disrupted due to COVID-19 globally [38]. In the preliminary results of a rapid assessment of service delivery for NCDs' during COVID-19 by WHO; 120 countries reported that NCD services were disrupted, particularly rehabilitation services, hypertension management, diabetes and diabetic complications management, asthma services, palliative care services and urgent dental care [39]. The primary causes of NCD service disruption included a decrease in inpatient volume due to cancellation of elective care and closure of population-level screening programs, and government or public transport lockdowns hindering access to health facilities [38]

Diabetes makes the patients more prone to develop infectious diseases due to the dysregulation of the immune system and is considered as a risk factor for the progression and poor prognosis of COVID-19 [40]. People with diabetes are bound to miss physician's appointments and routine clinic visits for fine-tuning of anti-diabetic medications among other things, due to the imposed lockdowns caused by COVID-19. This can result in sustained periods of unattended to hyperglycemia and probably hypoglycemia [40].

In Fiji, 32 fever clinics were established around the country when the COVID-19 community spread cases started to escalate, which lead to lockdowns and stringent measures whereby many patients who needed to attend constant weekly or monthly clinics for adjustments to their medications based on their health condition could not go to the hospitals or health centers because of these measures. A lot of staff from these clinics was re-deployed to operate the fever clinics which caused many NCD related problems for people already suffering from diabetes and hypertension [41]. Restriction in food supplies during the lockdown might force people with diabetes to alter their dietary habits that were earlier associated with good glycemic control. Attention to nutrition and adequate protein intake becomes important during these times as generally high consumption of carbohydrate rich foods take place in resource limited settings [42].

Additionally, self-isolation measures adopted in some countries have directly impacted food consumption at this time of anxiety, restricted mobility, and physical activity. Thus, the effects of increased overweight and obesity may persist for an extended period, even considering the alternating isolation [43]. This increase may be especially true in vulnerable populations that already presented food and nutritional insecurity as social-health issues, and may worsen even more with the progression of the COVID-19 pandemic [43].

Furthermore, long- term quarantine may add to unhealthy behaviors including unhealthy eating practices and may increase the risk of non-communicable diseases [44]. Overweight and obesity are on the rise in all regions, particularly among adolescents and adults [45]. As per COVID-19 internet updates, the COVID-19–associated hospitalization rate is 4.6 per

100,000 populations; higher rates have been noted with increased age, the highest among patients ≥65 years old [46]. Approximately 90% of the hospitalized patients had one or more underlying conditions. The common comorbidities identified are obesity, hypertension, chronic lung disease, diabetes mellitus, cardiovascular disease, and malignancies [46].

CONCLUSION:

COVID – 19 has brought the world to its knees and Fiji is no exception to this, because its economy heavily relies on international trade. The pandemic has not only caused many job losses in Fiji but is affecting the health of people, because many of them are unable to afford quality foods from the three food groups to have a balanced meal on a daily basis. The health authorities are also trying to come in terms with this and have tabled contingency plans to curb the issue of food insecurity for the duration of the pandemic.

More research needs to be done in this area to explore further how the diet of the people of Fiji is affected as the pandemic progresses. Such a research if conducted will provide inputs to better prepare Fiji in terms of food system security, should another pandemic occur in future.

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COMMENTARY:

THE NEW CORONAVIRUS COVID-19:
A mixed bag of questions, impressions and suggestions

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Have we learned a lot or have we lost the battle? It has been a year of trial-and-(t)error, pseudo-science, superstition and panic. It has been a year of discovery, wonder and despair. It's time to take stock and answer this murky question, as few rational people would subscribe to the view that the current state of affairs can count as a win over the virus.

Indeed, the New Coronavirus {"Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2)", "2019 novel Coronavirus (2019-nCoV)", "Coronavirus disease 2019 (COVID-19)" COVID-19} is a stern wake-up call for humanity. Had we risen to the occasion and faced Nature's challenge together, with the single purpose of survival, we would not have landed in the "year the Earth stood still", grimly remembered as 2020. Alas! Instead of acting as a sensible, civilised species, we frivolously engaged in our favourite sport — blame tossing and scoring political "touchdowns". While our postmodernism-intoxicated leaders bickered and curried political favour, the virus, which is not hampered by the vices of human stupidity, permeated every stratum of society and the pandemic quickly engulfed the planet.

People have tried denial, refusing to adapt to our new "normal", scoffing at basic safety instructions… but as the old adage goes: "The Nile is a river in Egypt". The virus does not care whether you believe in it or not; however, if it did have a preference, it would much rather that you didn't. Ostriches hiding their heads in the sand make for an easy hunt. We were quick to label the "it-will-never-happen-to-me" crowd as "Covidiots" but, sadly, we were not quick enough to educate them — for everyone's sake. People nursing the reckless belief that prayer alone, youth or luck is their immunity shield, are at least as dangerous as the "anti-vaxxer" crowd. They need to understand the severe risk they are running by playing the "COVID Roulette," and choose the, yes, mildly discomforting measures, such as wearing a face mask over running the risk of breathing and excreting through a tube for weeks on end, and ending up with life-changing

complications or even death. Why risk a potentially crippling aftermath and a ruined life? The COVID complications can, indeed, be extremely dire. A number of studies suggest that COVID-19 affects the central nervous system, potentially causing clotting and micro-contusions which may lead to stroke, Acute Disseminated Encephalo-Myelitis (ADEM) and bleeding within the brain and spinal cord. Recent studies suggest that this may result in the so called Long-tail COVID. Long-haulers are people who, months after having been cleared from the active virus, still experience aftershocks of acute symptoms of the disease. A recent hypothesis postulates that the damage done to the brain tissue results in the brain perceiving intermittent "echo" distress signals, as though the body is still under siege, causing the brain to send out energy conservation or even shut-down protocols.

I am a firm believer in the axiom that the truth will set us free. I believe that the crisis could have been averted at the outset, had we been administered a comprehensive dose of truth, with responsible journalists advocating public awareness, safety and discipline, rather than engaging in the media circus mongering fear, panic and sowing division.

Today society faces a lockdown fatigue and a rising tide of cynicism, pseudoscience, as well as misguided people fighting for their "right" to refuse vaccination and yet travel freely, i.e. their "right" to act as vectors for the virus. We are fighting a battle against ignorance on two fronts at once—the mainstream media bombards us with mind-numbing platitudes, while social media assails our consciousness with an endless torrent of dubious, uncorroborated hearsay. The truth is out there, but amid the cacophony of speculation, driven by ulterior motives, and the cynical cancel-culture of political correctness, few dare delve beneath the familiar veneer of the obvious and confront the devil hiding in the details. Let us roll up our sleeves and drag the miscreant into the light. For only by dissecting the problem and through free, open discourse, will we be able to contend with its complex nature. Speculation about origins and crystal balls aside, the responsible, constructive approach at this point in time is to examine the evolving challenges based on the current situation. We cannot change what came before, but we can change our attitude towards it and join the battle for public awareness now.

Best practices and personal hygiene questions:

In my mind, the most important thing is public awareness. Many people still believe that COVID-19 is similar to a common cold — a bit of coughing and fever and you get over it in a couple of weeks. This is nonsense. As mentioned, even asymptomatic COVID-19 can leave effects lasting for moths (loss of taste/smell, fatigue, headaches, and others). If the population acts responsibly, the virus will be brought to heel and contained, just as it has been in China.

Thus, people must take hygiene very seriously. Some things are common sense — wash your hands before picking up your food, do not bite your fingernails, do not walk in your home with shoes you wear on the street (you would be amazed how many people have this filthy habit). Other disciplines such as washing every single thing that comes from the shop are harder to live by. Since the beginning of the pandemic, every time I come back from the shop, I leave the bags by the door, prepare a vinegar-salt-detergent solution, put on a pair of gloves and spend an hour or even two wiping every crevice of every product before putting them away. Yes, this method is not for the faint of heart, as it is difficult and time-consuming, but my grandmother is over 90 years old and I cannot risk anything. However, even if you are not supporting an elderly person, you should still at least rinse everything that comes from the shop with some soap and warm water. Since the onset of the pandemic, I have not seen this stressed through any public campaign. It is common sense, as we all know that the virus can survive for over 48 hours on plastic and many times longer if kept cool in your refrigerator or freezer.

Most of us (me included) find throwing out disposable facemasks after each use to be an expensive waste. But if masks are to be reused, they must be disinfected properly, so as not to act like petri dishes for some very nasty bacteria. I find that lining the mask with a disposable tissue (discarded about every half hour), applying a light coat of tiger balm around my mouth and nose and spraying the masks liberally with a sanitiser after use, keeps the masks safe for multiple uses. Cloth masks may be more difficult to breathe through, but they are washable, and I keep some 10 masks on rotation to avoid using the same mask more often than once per week.

A number of impressive innovations have been made in mask design, both from the aesthetic and comfort and practicability perspectives (e.g., stopping glasses from fogging over, wash-ability, and even self-disinfection, and others). A fine example of such innovation is this high-end woollen Latvian offering, which utilises German Silver-plus microfiber technology to ensure that the virus is dead on arrival (DOA), before it can penetrate any unprotected cell. These appear to be impressive strides in combating the virus, but the science is not yet all in to back some of the claims.

COVID can clearly survive saliva, but can it survive saliva with mouthwash in it — or ginger juice? Another measure I take is to chew on a finger-nail sized chunk of ginger root, when I am in public places. It is perhaps a placebo, but empowering, as it makes me feel like I am doing my best to stay safe. Furthermore, I highly doubt that the virus could possibly survive coming into contact with mouthwash or raw ginger, but I would appreciate some scientific feedback.

How long does the virus stay in the air? Well, this largely depends on how still the air is, but in ideal circumstances, if a COVID patient coughs or sneezes in a stagnant environment (e.g. in a

lift), how large do the droplets have to be to infect a person? Can they enter through the eyes? A Japanese study demonstrated last year that water droplets after loud speech or a burst of laughter (not to mention a sneeze or a cough) can hang in a poorly-ventilated space for up to 40 minutes. But surely, the droplets large enough to carry the virus settle to the floor within about 30 seconds… then again, the virus is very small, so perhaps not? Ten micrometres may be plenty of space for a virus to inhabit. To be on the safe side, whenever possible, I spray my sanitiser at head-height into a lift before entering; avoid walking behind people on the street and wait 20-30 seconds before occupying the same space in shops. Are these measures prudent or unnecessary?

As a side-note, I think a YouTube channel showing footage from a microscope where the virus is destroyed by various agents, from vinegar and soap to hot water, to cola, to sea water, would garner millions of views and go viral very quickly. We all want to be inspired by watching the invisible enemy, which has ravaged our ranks, being easily defeated over and over again by means within our control! With my background in copywriting and marketing, I am certain that such a public campaign would quickly gain traction, go viral and inspire people to observe the rules of hygiene religiously. By backing such initiatives and promoting vaccination education, governments could turn the tide of infections.

Campaigns to keep up one's immunity with exercise and sufficient sunlight are also in order, in my opinion. When people sit indoors, especially in the winter months, they could develop vitamin D deficiency.

Vindicating vaccines:

Here I am out of my depth, but I am fortunate enough to have a life-long scientist as my father. However, I realise that relatively few people enjoy the privilege of being able to directly ask a relative or close friend about the science behind the scenes and receive a coherent and above all—accurate answer. In order to whole-heartedly believe that vaccines are the cures to the opportunistic ail that haunts and stalks us all, the layperson needs to better comprehend, in simple terms, what makes the virus tick.

Errors during replication are the way new strains are formed. Rapid evolution is, indeed, an ingenious defence mechanism. But what constitutes an actual new strain? If there are mistakes in virtually all copies can they be considered to be a set?

Let us examine some of the challenges that lie in the path to vaccination and demystify some of the misconceptions about vaccines. There are two primary culprits: ignorance and incompetence. Both can be cured with proper planning. My country, Latvia, is a proud, nearly two-decades-old member of the EU (a supranational entity with a combined GDP larger than that of China… though not for long after losing the United Kingdom). It makes for a good

case study due to the relatively low population and, hence, low infection rate (in August 2020 there were many days of zero cases and, in winter 2021, an average of about 700-800 cases per day). Although Latvia secured sufficient doses of a COVID vaccine at the dawn of 2021, the process of administration and distribution has been extremely slow. Apart from stepping up efforts to educate the general public, governments must learn to be efficient in the logistics of vaccine distribution and administration.

China, on the other hand, prioritised distribution and therefore has made impressive strides in containing the virus. In early March 2021, as I write these words, over 22 million Chinese citizens have been inoculated against COVID 19. To put this number into perspective, that is over 10 times the entire population of Latvia, but in my country, they are only now completing the protection of frontline workers and my 93-year-old grandmother will only receive her vaccine next week… as for my, just "over-the-hill" age group, we have been told vaccines will only become available to the 40-50 year-olds in June-July 2021. Furthermore, China has donated a significant portion of its vaccines in a gracious effort to support other developing countries. We should all learn from China's altruistic example, as capitalism is most certainly NOT the cure. By allowing ourselves to be driven by avarice and petty politics we become agents of the pandemic, abetting it in taking a grim toll on human lives. Standing shoulder-to-shoulder in this crisis is the only way to rein in the virus.

In fact, China, originally hit the hardest, has been at the forefront of combating the virus ever since. Decoding the virus genome and freely sharing invaluable data with the world back in January 2020, in a sincere effort to overcome our common threat. Even the head of the Wellcome Trust in London commended China in a Tweet: "*Potentially really important moment in global public health - must be celebrated, everyone involved in Wuhan, in China & beyond acknowledged, thanked & get all the credit. Sharing of data good for public health, is great for those who did the work. Just needs those incentives & trust*".

Vaccines are finally trickling in, but we face many questions about their composition and efficacy. Is it true that vaccines supplied by certain manufactures, such as AstraZeneca (AZ), are dangerous or ineffective when administered to seniors? The consensus is that if one is fortunate enough to get the call to be vaccinated by a formula from any legitimate supplier, one should jump at the opportunity (it goes without saying that you should always check and never seek to buy vaccines from unauthorised sources). But how much do we really know about the vaccines developed and rushed through approval in record time? It stands to reason that a placebo is more dangerous than no protection at all, because the person would be convinced that they are at least partially protected, while in reality they are just

as vulnerable as unvaccinated people. I recently learned that a prominent German politician declined a dose of the AZ vaccine, as it is not recommended for the over 65 age group. Most of us are not world-leaders who can afford to indulge in whimsical caprice, but… as a thought experiment, let us imagine that we are.

During the course of compilation of this article, however, Germany, closely followed by Sweden, approved the AZ jab for the 65+ population segment. Nonetheless, let's say, we also throw supply and demand out of the window, and focus on the essence of vaccines. For the sake of argument, imagine you have access to full doses of every vaccine available on the market. Which would be your vaccine of choice and would you be satisfied with just the one flavour — assuming you were offered to try others?

We are told that all the vaccines are equally good. Surely, this is a myth for the unenlightened masses and falls apart in the light of reason. Each vaccine was developed by a different company in a different geo-location (governed by diverse regulatory standards), where different strains of the virus have been prioritized. Furthermore, to top it all off, the vaccines were developed at different stages in the pandemic (i.e. at different times and research phases, as the threat mutates and evolves). There are so many vaccine formulas out there, many of which are only conditionally approved for emergency or early use. Since each vaccine is registered as a separate formula, its composition and modus operandi must differ. Since the principles and circumstances behind each vaccine differ, their effects cannot be identical, ergo: all vaccines have their strengths and shortcomings. Thus, we might surmise that, although any legitimate vaccine is better than no vaccine, it stands to reason that some vaccines are more effective than others and in an ideal scenario, if one could make an educated selection, one would most likely choose Sputnik V (91.6% efficacy, 2 doses 21 days apart, can be stored at 4 to 8 degrees Celsius) over the conditionally approved single-dose Johnson & Johnson vaccine (which offers about 85% protection) or the AstraZeneca vaccine (which must be stored at extremely low temperature). According to Pfizer-BioNTech, the efficacy is about 95% provided that the second, booster shot is administered within 21 days.

We are told that vaccines are perfectly safe. Since vaccines are clearly not uniform and protect against different 'bouquets' of virus strains, do you advocate for cumulative protection of vaccines, i.e. take the AZ vaccine once available, then a month later take the Moderna vaccine, a month after that Sputnik V and so on? If vaccines are perfectly safe, but protect only against certain strains and for limited periods, I believe that we are on the cusp of witnessing the rise of vaccine tourism, whereby wealthy folks hop around the globe collecting vaccines like stamps.

Since vaccines are essentially a way to trigger the detection of the virus and, consequently, the appropriate immune response, i.e. earmark this

particular protein as a severe threat, which triggers defences, is having been inoculated similar to having survived the disease? My (perhaps overly simplistic) view is that vaccination introduces a weakened virus into the body as a potential, albeit controlled, threat and teaches the immune system about the potential risk and to defend the body against similar threats - for a time. On the other hand, having faced and beaten the onslaught of the unmitigated, out-of-control disease, should have given the immune system a trial-by-fire, so the body should also recognize the virus as a clear and present danger for at least the duration of the average inoculation. Is this a reasonable deduction? So, after a patient has survived the disease and is declared negative, how long (if at all) does the immunity last? Most likely post-COVID immunity depends on the specific strain of the virus. Surely, it is not the same as having been vaccinated, right? Also, is post-COVID immunity good for just the one strain of the virus the patient has had or to the virus in general?

Are vaccines in perpetual refinement (to keep up with the virus' perpetual mutation)? In other words, are we engaged in an unending game of catch-up - just like with computer viruses, are 'patches' and 'updates' expected every season? Will a vaccine taken today be less effective/up-to-date than one produced a few months later? I wonder if the flu vaccines are updated every year, or is that virus more stable/ predictable? Will vaccines against the New Coronavirus, which are produced later, be effective against more strains, or is a vaccine's formula set, approved once for production and, hence, immutable, pending the next version's testing, registration and approval? This brings us back to the question of potential stack-ability of the benefits--if supply would allow, would it be a good idea to take full doses of several vaccines from different suppliers? Not in one giant concoction, of course, but with the minimal interval of, say a couple of weeks or a month in between?

Even after we have weathered the immediate crisis and have all been vaccinated, it will be prudent to continue to wear face masks in public places and when travelling. The ranks of the virus are ever being replenished with new, possibly more dangerous strains; most vaccines are certified to have just around 90% efficacy, while none of them may work at all against some mutated strains, right? With the world demand being so high, I doubt that the manufacturers give any guarantees (I understand that in the US they are not liable, even if their product causes harm to the people taking it). Wearing a mask seems to be a good rule-of-thumb in any case, as one has no idea which other threats are swirling in the ether...

"Researchers in the UK have also recently noticed a mutation called E484K – which is thought to reduce the virus's vulnerability to antibodies in the South African and Brazilian variants – has appeared in some samples of the British variant B117. Although only in a handful of cases so far, it is raising concerns that the

faster spreading British variant may also now pick up some ability to escape the immune systems of those who have been vaccinated or already infected."

How quickly after the injection does one develop relative immunity? This is like asking "how long is a piece of string", right? It all depends on the manufacturer, which only bolsters my argument that not all vaccines are created equal and in ideal circumstances one would opt to receive a vaccine developed as close as possible to one's home, so it best-suits the individual's specific circumstances (physiology, climate, as well as predominant COVID 19 strain). After all, it would be of little comfort to the people living in South Africa to have a high resistance to the virus strain running rampant in Brazil or the United Kingdom and vice-versa.

Is there a simple blood or saliva test that can be taken AFTER vaccination to check for the adequate presence of antibodies, i.e. to gauge the body's resistance to COVID? Such a test would be an invaluable tool in stemming the flow of infections, as individuals would be able to keep track of their factual resistance, rather than navigate these unchartered waters guided by “guesstimations”, standardised averages and arbitrarily-chosen figures. We would also be able to know when it is time for a repeat-inoculation, but most crucially, confirm that the vaccine one received is compatible with one's unique physiology and effective against the threat present in one's environment. Developing such a quick and accurate self-assessment test would be an invaluable contribution to science and public wellbeing as a whole. It would also greatly reduce the ignorance-induced anxiety which ravages our society at large. As we now understand, mental health has also been severely impacted by the state-of-emergency measures around the world; many people are fearful and confused, despite having never contracted the disease. Mental health and happiness is intertwined with the integrity of our immune and nervous systems.

Finally, perhaps a hereto unforeseen 'side-effect' of the lock-down stratagem could be a sharp decline in the immunity of the general population once the restrictions are lifted, due to the fact that most people (like me) are now hygiene-obsessed. Our bodies may become unaccustomed to dealing with mild threats we took for granted in the pre-COVID-19 era. We are all incessantly wearing masks, washing our hands compulsively and as a result, taking in a lot fewer germs — COVID-19 (and its nasty 'siblings') is not the only danger out there, of course. Or... will the opposite scenario come to pass? In other words, could our immune systems rebound and become stronger with this 'COVID holiday'? We are all trying to eat healthier, home-cooked meals, have more time for exercise (those of us inclined to partake in home fitness routines), rest more and try to take additional vitamins... so maybe the opposite is true and our immune systems will be elevated and restored?

It is amazing what humanity can accomplish in a short period of time, when the incentive is a severe economic threat. I am sure that there are many families touched over the past 4 decades by HIV/AIDS who are wondering why that threat was allowed to fester and endure. But, I guess, just like with curing cancer, treating AIDS is a cash-cow for the 'Big Pharma' industry. Like eradicating war in far-away-lands, there is no real appetite in the upper echelons of power to slay the goose that is so prolific in laying golden eggs... Or perhaps it is the stigma that is associated with becoming HIV positive, society tends to act like it is the patient's fault for having contracted the disease through questionable life choices. Or perhaps it is like Ebola, considered to be lower priority because it is not air-borne and thus less volatile/easier to ignore and contain. If these pathogens ever mutate enough to spread like COVID (or become even more virulent), the people who have made bank on the misfortunes of others will also find themselves in an identical world of hurt. Although most of us are incapable of influencing world-scale events and no one can change the self-centred callousness ingrained into human nature, the avarice-driven status-quo of the world, the thought that if things ever get out of hand, those playing with fire will also get burned with the rest of us, is vaguely comforting... 'Vaccine diplomacy', now played by certain prominent vaccine producing countries is beneath abhorrent. Surely, the morally bankrupt strategy of allowing the threat to endure and evolve in less-developed nations will backfire in the long run.

Yes, COVID 19 has been a wakeup call and a stern stress-test for all of humanity. In these trying times, we have been confronted with the best and worst aspects of humanity and, collectively, we have failed to rise to the occasion of Nature's challenge. But, as Nelson Mandela once said, "I never lose—I either win, or I learn." Judging by the way the pandemic was handled (or, rather, *mishandled*) we can easily surmise that had this been a Great Filter (a civilisation-ending event), the lack of preparation around the world would have resulted in a catastrophic loss of life. Yes, the world was thrown into disarray and the crisis exposed numerous systemic failures, but not all is lost. One can only hope that our leaders have learned from their colossal blunders, our heroes (frontline medical workers) know what is at stake, and our scientific minds will be better prepared in the future. It is my sincere hope that, when the next threat arises to face humanity—and arise it will — we come together as a single, sentient species with the single purpose of survival, rather than allow ourselves to be fettered by the artificial constraints of political and financial gain. If we don't learn from this pandemic, the next one could turn out to be the Great Filter and we will learn that Homo sapiens have much more in common with the T-Rex than we originally imagined. Now that Pandora's Box has been opened and the virus unleashed (or rather has been allowed to run rampant while we wallow in

the quagmire of bureaucracy), it would be irresponsible and downright naïve to expect the virus to just wither and disappear. Eventually, we will get tired of counting waves and just accept the 'new normal': for your own protection, wear masks when travelling or visiting crowded places. Just like no one counts the ocean waves crashing on the shore, we will soon lose interest in counting COVID waves. What matters is not the number of waves, but that we learn and adapt with each wave to make their effects ever less devastating.

There is still so much for us to discover, as the Latin saying goes: "*Vīta brevis, ars longa, occāsiō praeceps, experīmentum perīculōsum, iūdicium difficile.*" ("Life is short and art long, opportunity fleeting, experimentations perilous, and judgment difficult.") However, by closing ranks to work together in sincere collaboration we shall solve the common challenges we face. There is an elegant Chinese idiom to sum up my efforts at this juncture: **抛砖引玉** (lit. "I throw a brick, hoping to dislodge jade", fig. to attract feedback from others by putting forward one's own modest ideas to get the ball rolling) and so, I look forward to reading the thoughts from others or answers to my many questions.

Stay sane, stay safe and truth be with you!

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LETTER TO THE EDITOR:

COVID-19 VACCINE DEVELOPMENTS AND CONSIDERATIONS FOR APPRAISAL OF THE EVIDENCE

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Dear Editor

The infectious SARS-CoV-2 (Coronavirus Disease 2019: COVID-19) has caused significant impact globally and necessitates a rapid response to curb the COVID-19 pandemic. This includes development of vaccines over compressed timelines, which requires international collaboration to increase the understanding of viral genomics, structural biology as well as explore new vaccine platforms [1]. This includes DNA- and RNA-based vaccines, which are appealing during this infectious crisis, as synthetic processes to manufacture them are relatively quick without the need for culture or fermentation. Trials involving these platforms have progressed, despite the fact that there are no approved RNA vaccines to date.

This fervent activity for COVID-19 diagnostics, vaccines and therapeutics is also accompanied by an outpour of scientific publications, resulting in the World Health Organisation (WHO) and major journals cataloguing COVID-19 related research into collections and databases [2]. The urgency of sharing such scientific information has also led researchers to publish pre-print manuscripts in servers such as medRxiv without peer review. For clinicians and policy makers, the challenge is to be able to critically appraise this overwhelming deluge of information to decide on benefits and risks of treatment. In this letter, several considerations for appraisal of the literature on the COVID-19 vaccines are discussed.

Firstly, there are several types of candidate vaccines for COVID-19, the major ones being live attenuated virus, recombinant viral vector, inactivated virus, protein subunit, virus-like particles and nucleic acid. Each platform has their own strengths and weaknesses; for example, live-attenuated tends to create a

stronger immune response, but would not be suitable for immunocompromised patients [3].

When reviewing the evidence from vaccine trials, it is important to determine generalisability of findings to the target population. Exclusion criteria of studies should be reviewed, particularly in terms of age, ethnicity and medical comorbidities. Outcome measures should also be scrutinized; is the outcome based on levels of neutralising antibodies, or does the vaccine reduce the risk of acquiring infection, symptoms of infection, or rate of viral shedding and infectivity? Trials may occasionally be discontinued early if there is evidence of a difference between treatment and control groups during the pre-specified interim analysis. When this occurs, a longer duration of follow-up monitoring is necessary for evaluation of long-term safety.

Immunogenicity:

Phases I and II trials aim to identify the appropriate dose-range on healthy volunteers and offers preliminary data for efficacy and side effects. The evidence from these trials compares participant serum levels of neutralising antibodies compared with convalescent serum levels from recovered Covid-19 patients, assuming these titres would meet minimum requirements for immunogenicity. However, the absolute antibody level required and whether these equates to real world protection from infection remains unknown, thus the need to await Phase III trial outcomes. These titres may also not be comparable between studies due to lack of assay standardization, hence we are unable to compare efficacy between vaccines. Information regarding the duration of immunogenicity and durability of response is also not currently available so it remains unclear whether these vaccines require repeat doses in the future.

Changes to the immune system with age also mean that the response to vaccines in older people should be assessed separately. Immunosenescence leads to defects in the innate and adaptive immune response, thus vaccine responses tend to be weaker and decline earlier. Thus, improved vaccination strategies, adjuvants and vaccines specifically targeting the aged immune system may be required [4].

The coronavirus genome is also prone to mutations or genetic drift, which may affect immune recognition. For example, the 23403A>G variant in spike protein B-cell epitope is found in European countries such as Netherlands and France, but not in China. It is crucial to ensure that vaccines will provide an international breadth of coverage for different virus strains caused by mutations [5].

Reactogenicity:

Safety data for COVID-19 vaccines are lacking, which necessitates active surveillance and follow-up of vaccine recipients, particularly as mass vaccination programmes may occur to resolve the pandemic. Specific sub-groups

should also be evaluated to determine the risk and benefit of vaccination, particularly the elderly, those with chronic illnesses, and people with allergies and intolerances.

While there is only limited data available, any information suggestive of possible safety issues should be highlighted for monitoring. This includes animal studies, particularly in non-human primates, which demonstrate vaccine responses close to humans. For example, vaccine-associated enhanced disease (VAED) may occur where an immune response to a vaccine causes a higher risk of adverse outcomes upon infection compared to infections without prior vaccination. Concerns of VAED risk for COVID-vaccines should be raised if pre-clinical studies show a high levels of binding antibodies, low levels of neutralising antibodies, low affinity antibodies, dominant T-helper 2 T-cell responses, increased post-challenge inflammatory responses, enhanced lung pathology or unexpected extra-pulmonary lesions. These markers should be evaluated in Phase I and II trials as well [6].

Overall, there is much information updated almost daily regarding the Covid-19 vaccine developments, yet insufficient data to make absolute informed decisions to choose between the different types. There is much to learn and catch-up regarding what we hope to be the savior against this pandemic.

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URINARY LEVELS OF PHENYLETHYLAMINE PREDICT MOOD, COMPREHENSION AND ACADEMIC PERFORMANCE IN HEALTHY UNDERGRADUATES

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Running title: *PEA marks depressive-like behaviors*

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ABSTRACTS:
Phenylethylamine (PEA) is a neuromodulator that plays a crucial role in neuronal homeostasis. However, it is unknown whether the concentration of PEA can predict mood, comprehension and academic performance of undergraduate students. The study investigated the correlation of urine PEA, and mood, comprehension and academic performance of undergraduates. One hundred and sixty healthy volunteers were randomly selected from undergraduates of Afe Babalola University. These individuals were recruited and informed of what they should expect during the study and informed consent was obtained. Questionnaires were administered to gather volunteers' biodata, socio-demographic background, mood and academic performance. Comprehension test was administered with result recorded and urine sample was collected for PEA estimation. Our results showed that urine PEA levels were significantly reduced in subjects with low mood, poor comprehension test score and poor academic performance. The present study demonstrates that weak academic performance, poor comprehension and low mood in healthy subjects are associated with reduced urine PEA.

Keywords: Academic, Comprehension, Mood, Neuromodulator, Performance, Phenethylamine.

INTRODUCTION:

Phenylethylamine (PEA), known as β-Phenylethylamine (β-PEA) and 2-phenylethan-1-amine, is a naturally occurring organic compound, which can also be synthesized and used as supplements [1]. Phenylethylamine is a monoamine alkaloid present in trace amount in the central nervous system (CNS). It plays an important role in neural homeostasis as a neuromodulator and, to a lesser extent, a neurotransmitter in the CNS [2]. It is synthesized from the amino acid L-phenylalanine by decarboxylation catalyzed by Aromatic L-amino acid decarboxylase.

PEA can also be found in many other organisms and foods, such as chocolate, especially after microbial fermentation [3]. Phenethylamine has been sold as dietary supplement in attempt to treat mood instability and to achieve weight loss [4]. However, in orally ingested PEA, a significant amount is metabolized in the small intestine by Monoamine oxidase B (MAO-B) and then by aldehyde dehydrogenase, which converts it to phenylacetic acid [5], and for significant concentrations to reach the brain, the dosage must be higher than for other methods of administration [6]. Phenethylamine has earlier been used as a biomarker for some neurological disorders such as bipolar disorder which is associated with elevated plasma level of PEA [7]. Urine PEA was observed to be low in patients with autism, attention deficit hypersensitive disorder (ADHD) depression, and attention deficits [8, 9]. However, it is not known if urine level of PEA in healthy undergraduates is related to their academic performance, comprehension and mood. The present study aimed at investigating the relationship of urine PEA levels with academic performance, comprehension and mood in undergraduate students.

METHODOLOGY:

One hundred and Sixty (160) healthy volunteers randomly selected from undergraduate students of Afe Babalola University were used in this study. These individuals were informed on what they need to do during the study and informed consent was obtained thereafter. They were screened and certified healthy by the school health center before recruited for the study. The study design was a cross-section descriptive study. Subjects were asked to sit comfortably on a chair inside the physiology laboratory of Afe Babalola University which is at a comfortable room temperature, and provides a quiet and neutral environment with no distraction. Interactions between participants and investigators were limited to those necessary for collecting data.

Comprehension was assessed with the participants using a reading task extracted from International English Language Testing System (IELTS) [10]. It involves reading a passage within a given time and answering of the follow up questions. Test scores were recorded

against their cumulative grade point average (CGPA) which is a measure of academic performance graded on the scale of 1 to 5 [10].

Mood assessment was done using self-report 1 to 10 mood rating scale where participants will rate their mood by giving score from 1 to 10 with 1 indicating extremely sad and 10 indicating very happy as previously described [11]. All the 160 participants were separated into two groups, mood score 1 to 5 and mood score 6 to 10. The point mood score was recorded against urinary level of PEA.

Determination of urine Phenylethylamine:

Point urine samples were collected via aseptic procedure and immediately stored in the refrigerator for the determination of PEA. Urine level of PEA was determined with an Enzyme-linked Immunosorbent Assay ELISA kit (Fortress Diagnostic, Antrim, United Kingdom) with high sensitivity and specificity for detection of PEA, and no significant cross-reactivity or interference between PEA and analogues. This assay used the competitive inhibition enzyme immunoassay technique. A monoclonal antibody specific to phenylethylamine has been pre-coated onto a microplate. A competitive inhibition reaction was launched between biotin labeled phenylethylamine and unlabeled phenylethylamine (Standards or samples) with the pre-coated antibody specific to phenylethylamine. After incubation the unbound conjugate was washed off. Then, avidin conjugated to Horseradish Peroxidase (HRP) was added to each microplate well and incubated. The amount of bound HRP conjugate is reverse proportional to the concentration of β-endorphin in the sample. After addition of the substrate solution, the intensity of color developed is reversely proportional to the concentration of PEA in the sample.

This study was approved by the Ethical Review Committee of Afe Babalola University, Ado Ekiti, Ekiti State, Nigeria and consent was provided by each participant.

One hundred and sixty apparently healthy students, within the age bracket of 15 – 25 years, in Afe Babalola University were recruited for the study. The study was carried out in the physiology laboratory of the school.

All data were analyzed using Graph pad prism 5 and expressed as the Mean ± S.E.M. Data were analyzed using Kruskal-Wallis test for analysis of non-parametric data followed by Dunn's post hoc test. The level of significance was considered at $p<0.05$

RESULTS:

The socio-demographic variables of the participants are presented in Table 1.

Undergraduate comprehension score correlates with cumulative grade point average (CGPA):

The students with CGPA of 4.40 ± 0.09 had over 75% score in comprehension test while those with 3.19 ± 0.09 and 2.80 ± 0.08 had 50 - 75% and less than 50% scores respectively as shown in table 2.

Reading habit enhances academic performance:

Participants that read average of 3 - 4 books per month and greater than 5 books per month had higher CGPA compared with participants that read only 1 - 2 books per month as shown in table 3.

Comprehension correlates with urine phenylethylamine concentration in healthy undergraduates:

The urine PEA concentration of undergraduates with >75% comprehension score is significantly higher than undergraduates with 50-75% and <50%. Likewise, undergraduates with 50-75% comprehension score has higher urine PEA concentration than those with <50% comprehension score as shown in table 4.

Mood score corresponds with urine phenylethylamine concentration in healthy undergraduates:

The urine concentration of PEA in undergraduates with high mood score was significantly higher than undergraduates with low mood score as shown in table 5.

Thought affects urine phenylethylamine concentration:

The level of urine PEA was significantly higher in undergraduates with dominant positive emotion compared with those with dominant negative emotion as shown in table 6.

Table 1: socio-demographic variables

Parameters	**Percent (n)**
Age group	
16-17	21.9 (35)
18-19	33.1 (53)
20-21	31.9 (51)
>22	13.1 (21)
Gender	
Male	25 (40)
Female	75 (120)
Departments	
Medicine	20 (32)
Physiology	15 (24)
Anatomy	28.1 (45)
Others	36.9 (59)

Table 2: Cumulative grade point average (CGPA) and comprehension test (CT) in healthy undergraduates

Comprehension test (%)	CGPA
< 50	2.80 ± 0.08
50 – 75	3.19 ± 0.09
>75	4.40 ± 0.09*#

(n=47 for CT<50; n=60 for CT 50-75; n=53 for CT>70). Data were analyzed using Kruskal-Wallis test for analysis of non-parametric data followed by Dunn's post hoc test (*p<0.05 vs. <50; #p<0.05 vs. 50-75).

Table 3: Cumulative grade point average (CGPA) and average number of other books read per month in healthy undergraduates

Average number of books	CGPA
1 – 2	2.67 ± 0.09
3 – 4	3.43 ± 0.06*
>5	3.73 ± 0.08*

Data are expressed as mean ± S.E.M. (n=54 read 1-2; n=51 read 3-4; n=55 read >5).

Table 4: Comprehension Test (CT) score and urine Phenylethylamine (PEA) concentration in healthy undergraduates:

Comprehension test (%)	PEA (ng/mL)
<50	32.79 ± 1.74
50 – 75	38.98 ± 1.67*S
>75	55.53 ± 2.30*#

(n=52 for CT<50; n=53 for CT 50-75; n=55 for CT>70). Data were analyzed using Kruskal-Wallis test for analysis of non-parametric data followed by Dunn's post hoc test (*p<0.05 vs. <50; #p<0.05 vs. 50-75).

Table 5: Mood score and urine Phenethylamine (PEA) concentration in healthy undergraduates

Mood score	Urine PEA (ng/mL)
1 – 5	41.27 ± 1.58
6 – 10	55.36 ± 1.59*

(n=52 for 1-5 mood score; n=108 for 6-10 mood score).

Table 6: Thought and urine Phenylethylamine (PEA) concentration in healthy undergraduates

Mood score	Urine PEA (ng/mL)
Negative	51.59 ± 3.37
Positive	66.10 ± 1.48*

(n=43 for negative thought; n=117 for positive thought).

DISCUSSION:

The present study has demonstrated the relationship between urine PEA concentration and academic performance, comprehension and mood. Our results showed that undergraduate students (n=53) with highest CGPA (4.40±0.09) had comprehension score >75% compared with those that had CGPA of 3.19±0.09 (n=60) and 2.80±0.08 (n=47) with corresponding comprehension scores of 50-70% and <50% respectively. This confirm the importance of the ability to comprehend in academic performance and this finding is consistent with the result of previous study by Kerstjens and Nevel, which showed positive correlation between International English Language Testing system (IELTS) test score and academic performance [10]. Therefore, the ability to solve problem form an integral part of cognition as previously reported [12]. However, cognition entails more than the ability to comprehend and solve problems [13]. In addition, the prediction of associated factor with academic performance has been an interesting study in cognitive neuroscience research [14].

Several factors including reading habit, thinking strategies and stress have been shown to influence working memory, learning and cognition [15, 16]. In the present study, it was observed that reading habit affects academic performance as shown in table 3 where participants that read average of 3-4 other books (books that are different from their lecture notes) per month and greater than 5 books per month had higher CGPA compared with participants that read only 1-2 books per month. Crucially, the present result showed significant increase in the level of urine PEA in participants with 50-75% and >75% comprehension score compared with those that have <50% comprehension score. The urine PEA concentration was also higher in participant with >75% comprehension score compared with those that have 50-75% comprehension score. This is similar to previous studies that demonstrated association between PEA and attention deficit [8]. The finding of the present study therefore suggests that urine PEA in healthy individuals may predict academic performance.

Besides, the results of the present study revealed that urine PEA concentration was significantly higher in participants with predominant positive emotion (positive thought) compared with those that expressed negative emotion (negative thought). Therefore, this observation corroborated previous work that documented an association between low PEA and depression [9]. By extension the present finding showed higher level of urine PEA in participants with high mood (6-10) compared with low mood (1-5), suggesting the diagnostic potential of urine PEA in individual with depressive-like behaviors.

CONCLUSION:

The present study demonstrates that poor academic performance, poor comprehension and low mood in healthy subjects are

accompanied by reduced urine phenylethylamine. Therefore, urine phenylethylamine could be a useful biomarker for determination of depressive-like behaviors.

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PATIENTS' PERCEPTIONS ON FACILITATORS AND BARRIERS OF UTILIZATION OF CLINICAL LABORATORY SERVICES: SUGGESTIONS FOR PACIFIC NATIONS

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ABSTRACT:
Clinical laboratory is an essential department in the health facility in developing Pacific Island countries. Patient perception on services being provided by the clinical laboratory department is very important because laboratory results help in diagnosis of patient's conditions. In the developing Pacific Island countries, there is very less to no research done on the patient's perception on clinical laboratory services among patients. The aim of this study was to review patient's perception on the main factors affecting clinical laboratory services among patients and to provide a suggestion for Pacific countries. The literature search was done using Medline, Embase, Scopus, and Proquest databases, and relevant keywords were applied to find studies which have been conducted in the field of medical laboratory sciences specifically looking at patient's perception on utilization of laboratory services. All the studies pertaining to the topic, published between 2000 and 2020 in English language were reviewed and the main themes were identified. The results showed that patient's perceptions are primarily based on their experience with the three main cyclic phases of the clinical laboratory; these three phases are the Pre-analytical phase, Analytical phase and the Post-analytical phase and the way services are delivered in the clinical setting. The patients prefer the laboratory staff to display professionalism and have good communication and clinical skills. Negative perceptions arise mainly in terms of the turnaround time of test results, poor accessibility, incompetency of staff, unavailability of laboratory handbook and staff not being able to answer questions. This study concluded that there is a need to tailor interventions by considering the factors identified in this study that may be used to improve the clinical laboratory services among developing Pacific island countries.

Keywords: Patients' Perceptions, Clinical Laboratory Utilization, Facilitators, Barriers, Pacific

INTRODUCTION:

The clinical laboratory department is one of the most important departments in a health, facility; it helps physicians to come up with a definite diagnosis to a patient's condition. A Clinical guide for medical students in Aden University mentioned "The laboratory is an important part of medical diagnostic procedure", as it helps add objective patient information to subjective history and physical examination of patients [1]. Clinical laboratory testing has advanced over the years giving more definitive diagnosis and a faster turnaround time of lab based results. The clinical laboratory has various sections which look at different specimens which are sent in by the physicians and samples which are collected in the lab outpatient department for processing. Some common sections of the clinical laboratory are; Clinical Chemistry, Microbiology, Blood Bank, Hematology, Central Reception Area, Histology, Cytology and Serology. Physician send request for test to be done on the patient's blood, serum, plasma urine, stool, exudates, transudates, secretions, or other fluids [1].

The clinical laboratory setup follows a laboratory cycle, known as "laboratory testing cycle" [2]. It consists of all steps between the time when a clinician requests a laboratory test the time the sample is collected from the patient for testing and the results are returned to the clinician. A study done by Wians et al., [2] in Dallas states that the laboratory cycle consists of 3 phases: pre-analytic, analytic, and post-analytic [2]. In a clinical pathology laboratory, patients are the ultimate customers. However, physicians enjoy a preferred customer status, and their opinions are also an essential component in developing a customer-oriented laboratory [3]. In the United States (US), major agencies that accredit laboratories, require assessment of customer satisfaction as one of the components in accreditation [3].

Patients are very important and ensuring that their views and suggestions are considered and implemented is paramount. This is also stressed in a study done by Sajid et al., [4] in United Kingdom (UK) that mentioned the importance of a quality health care system to ensure continues care. Assessment of quality usually focuses on technical concerns including the process through which care is delivered; it becomes more precise when it is based on the application of standards integrating the patients' views, experiences and perceptions. Patient satisfaction is not just limited to the service, but to the many factors which equally contribute to the overall views of the patients [4]. Patient satisfaction is influenced by the quality of service and professionalism of the staff, provision of adequate information to collect specimen and when and how to receive laboratory results, waiting time to receive laboratory results, availability of ordered laboratory tests, cleanness of the laboratory room, location of

laboratory room, availability and accessibility of latrine [5].

There are tangible and intangible determinants of service quality. A research done in Turkey by Kara et al., [6] found that the relationship between quality of service and customer satisfaction is that all intangible factors associated with service quality turn out to be unequivocally more important than the tangible ones. In other words, intangible factors appear to play a statistically more significant role compared with tangible factors in determining the overall customer satisfaction and the quality of non-profit health-care services [6]. Developing nations are making every effort to provide their citizens to receive fundamental healthcare even with limited consumer resources and other health related resources.
A study done by Hussain et al., [7] in Pakistan sought to investigate how pharmacy services, laboratory services, doctor–patient communication, and physical facilities measured patient satisfaction alongside the quality of the hospital service. The authors concluded that all of these services played a vital role in determining the overall patient satisfaction. Furthermore, if one of the factors caused patient dissatisfaction than the overall satisfaction for the other services accessed by the patients would be reduced [7].

Similarly, in the Pacific the health care system has progressed over time from being a noble profession to being a customer-oriented service industry [8]. The contributing factors to this change are the availability of information through internet, higher expectations of patients, health insurance schemes, and advancement in medical technology [8]. This has resulted in delivering high quality of health care services; safe, equitable, evidence based, timely, efficient, and patient centred services [8]. Since limited research has been conducted to assess the factors affecting the utilization of laboratory services in the Pacific, this study aims to identify the factors causing facilitators and barriers of utilization on laboratory services and suggest further research in this area for the developing pacific island countries.

METHODOLOGY:

This review focused on several aspects related to patients' satisfaction, potential facilitators and barriers of utilizing of clinical laboratory services. Four databases were used to search for publications on relevant studies: Medline, Embase, Scopus, and ProQuest. The keywords used included: (Perceptions OR Belief OR Opinions) AND (Laboratory* OR "Clinical Laboratory") AND (Patients OR "Patient Satisfaction"), AND ("Laboratory Services" OR "Lab"). The focus of the search were studies published between 2000 and 2020 and in English language. The titles of all the studies were scanned by two independent researchers and those not relevant were excluded. The abstracts of the remaining studies were

reviewed and the full text of the 40 articles that met the study inclusion criteria were printed for future review and to formulate the themes that are discussed below.

RESULTS:

Table 1 shows the themes that were found in this study that determine the patient's perceptions on facilitators and barriers of utilization of clinical laboratory services.

Table 1: Themes and sub-themes

Themes	Sub-themes
Pre-analytical related factors	1. Incompetency and Knowledge 2. Patient Interactions and Availability of Laboratory Handbook 3. Laboratory infrastructure and Occupational Health and Safety (OHS)
Analytical related factors	1. Turn Around Time of Tests, Results Notification and Reporting 2. Laboratory Standards and Protocols 3. Sufficient Stocks and Availability of test
Post-analytical related factors	1. Results Reporting & Notification (Format & Accessibility) 2. Availability of Staff to answer question and waiting time

Theme 1- Pre-analytical related factors:

Pre-analytical phase is one of the most important phases of the three testing phases in the clinical laboratory [9]. Pre-analytical phase is the phase where all the laboratory based decisions are made and corrected to ensure that quality results are delivered to patients, this phase includes prescribing to testing, using the correct forms, collecting of samples and receiving of samples, patient identification, collection of the sample, handling of the sample, sorting out, pipetting of certain samples and centrifugation of some samples [9]. Negligence in any of these steps can lead to incorrect results in the pre-analytical phase [9]. The pre-analytical phase is crucial for analysis and is equally important as the other two phases [10].

The Clinical Laboratory Standards Institute (CLSI) and the Laboratory Quality Management System (LQMS) have set standards related to blood sampling and sample transportation and handling [10]. The compliance to these guidelines is low, especially in cases when blood is collected outside the laboratory. Samples with patient identity are swapped, samples reach the laboratory late, either samples are mixed or mislabelled [11]. Therefore, to achieve appropriate quality improvement and to reduce the burden of preventable errors, standardization of the pre-analytical procedures including patient preparation and identification,

sample collection, transport, handling, storage and preparation for testing should be enforced by the laboratory professionals outside the Laboratory [11]. Standardization of several pre-analytical activities can be achieved by major adherence to available guidelines, implementation of total quality management system that include pre-analytical requirements, as well as continuous education of the health staff with blood sampling responsibilities [11].

While analytical standards are developed, there is a gap in the development of standards for the pre-analytical phase. This phase is prone to errors the most as the steps involved are directly dependent on humans and out of direct control of the laboratory. Such errors in pre-analytical stage are only picked out later in the analytical or post-analytical phase [12].

Correct practices and strategies of error prevention can reduce pre-analytical errors, occur while collecting blood specimen, urine and cerebrospinal fluid. Most of these errors can be prevented easily if there is continuous education of the personnel involved and responsible for executing this phase [12]. These pre-analytical errors can lead to loss of patient trust in diagnostic services and also spoil the laboratory's reputation that can lead to an increase in the overall operating expenses, both for laboratories as well as the hospitals. Compliance with good laboratory practices can significantly reduce the frequency of pre analytical errors [9].

1. Incompetency and insufficient Knowledge:

Pre-analytical errors are mostly related to incompetency and insufficient knowledge of laboratory procedures; it is commonly seen that staff who attend to the patients tend to make these simple errors which delays the overall analytical process. In this phase one may observe the highest frequency of errors, the highest risk to professionals' health and the highest rates of human error. Studies indicate that approximately 40% to 70% of errors occur in the pre-analytical phase [13].

A study in Dallas stated that the top five pre-analytical errors are; specimen collection whereby the tube not filled properly, patient identification error, inappropriate specimen collection tube/container, test request error, empty collection tube [2]. Another study done in India highlighted similar pre-analytical errors but also mentioned some technique related errors such as; patient preparation, selecting and site preparation for blood collection, tourniquet application and time, proper venepuncture technique, order of draw, proper tube mixing, proper tube handling and specimen processing, centrifugation, special handling of blood specimens, stability for whole blood, serum and plasma, collection time and date, method of collection for other sample apart from blood [12].

The clinical laboratory also has its troubleshooting and error minimising steps to ensure that errors are not predominant in the later stages and those patients get the best quality results in a timely manner. This process

was highlighted in a study done in Pakistan, whereby once samples are received in the laboratory they are sorted out for any problem at the Central Reception Area (CRA) and registered before transporting to respective sections [9]. In case, any problem arises, it is manually registered in the logbook. Samples are rejected on the basis of pre-set rejection criteria, as follows: unlabelled specimen container, specimen without request form, incorrect tube (wrong choice of tube), wrong label/wrong medical record number, incorrect quantity or insufficient sample, hemolysed sample, anticoagulated sample Ethylenediaminetetraacetic Acid (EDTA and Citrate) with clots, improper sample transport, improper container closure, specimen delayed in transit making results invalid, diluted sample [9]. A study done by Wagar et al., [14] in California looked at samples that were collected by patient themselves, this area is important as it falls back onto the staff to be able to relay the correct information on sample collection and transportation of the specimens and if this step is not done well, the following errors would be seen; container leaking, contamination, improper collection and handling, collections container under filled or overfilled, specimen not received and using incorrect collection container [14]. A study done by Codagnone et al., [13] in Detroit showed how a total of 364 117 physicians' test orders, corresponding to 135 665 patients' visits, of which 7.4% (n = 10 094) were rejected because of errors in the pre-analytical phase of laboratory medicine. Stratification of data by the site of service revealed that the proportions of rejected specimens was the highest in the inpatient services (47.15%) followed by the emergency department and outpatient services with 27.40% and 25.39%, respectively. This simply shows how high the rates of these pre-analytical errors are and how they affect the overall service. The rejection criteria used in the study as part of a laboratory setting includes; clotted samples, hemolyzed and lipemic samples were visually applied. Only the clotted samples collected in tubes with EDTA and sodium citrate were counted [15]. The samples considered with insufficient volume were those presenting volume lower than the necessary for the conduction of a specific test, previously standardized and/or by consensus of the laboratory staff in this hospital [13].

2. Patient Interactions and Availability of Laboratory Handbook:

Staff interaction with the patients depicts the quality of service being provided. Quality of the medical service and professionalism of the staff is the main preference of patients, followed by good attitude and personal attention [16]. A study by Oja et al., [17] reported that patients needed additional instructions on the preparation of patients for laboratory tests (27.3%) and on the collection and handling of samples (27.8%) and about 21% were not

satisfied with the schedule of phlebotomy rounds [17].

Patient interaction and the way staff members approach the patients is one the most important aspects under patient interactions and service provided. A study done by Tadele et al., [18] in Ethiopia talked about the patience, communication, respect and language. In another study done in Ethiopia, about 67% of the respondents were satisfied with the courtesy of laboratory personnel, and 26% of them were unsatisfied with the orientation or advisory services provided to them before sample collection [19]. The same study also showed that 50% of respondents were satisfied with the clarity and adequacy of information they got, and 17.8% were dissatisfied [19]. An interesting aspect was discussed in a paper done in Fiji, on the importance of trust and communication for a better and effective treatment given to the patients [20]. The paper mentioned how trust and communication with a patient contributes to improved patient outcomes with patients being satisfied with the services [20].

Another important aspect which is related to the overall customer satisfaction is the availability of laboratory handbook. The laboratory handbook is a detailed booklet that contains all the information about the laboratory. The number of departments in the laboratory, the type of test available in the facility, number of staff members available, the location of laboratories, their contact details, the heads of the facility, the reference ranges for the tests, the conditions of sample transfer, other important laboratory related information patients may need to know in terms of sample collection and the processes involved in collection of sample [16]. A study done by Oja et al., [17] in Finland, mentioned how the laboratory user's handbook was updated paying special attention to the indices and the table of contents. Apart from these instructions for blood collection, including pictures of the tubes used for venepuncture for paediatric samples, were produced and delivered to the clinical units. The instructions for patient preparation for laboratory tests in clinical chemistry and nuclear medicine were rewritten and delivered to the clinics. The study showed that the Laboratory Users' Handbook, showed high (>20%) levels of dissatisfaction among patients [17].

3. Laboratory Infrastructure and Occupational Health and Safety (OHS):

Any health facility which provides service should always ensure that the area provided to the departments is safe and hygienic for patients. The OHS of the laboratory department is a crucial aspect when it comes to customer satisfaction as no patient would want to be seen or be treated in an environment which is not safe and hygienic for them. A study done by Mindaye et al., [21] in Ethiopia, highlighted some OHS issues which are important to consider while providing service. These include cleanliness of blood drawing area, comfort of chairs, Latrine accessibility and availability, Latrine cleanness

and comfort, cleanness and comfort of waiting area. In the study most (95.6%) of the respondents were satisfied with the service, where cleanliness of blood drawing area and comfort of chairs in blood drawing room (88.1%) were rated well. However, most of the clients showed low satisfaction level with latrine cleanness and comfort (63.5.0%), accessibility and availability of latrines (64.5%) [21]. Similar results were seen in a study done in Makkah, where cleanliness of blood drawing area and comfort of chairs had the higher satisfaction rate of 97.2% and 88.8% respectively [22].

A study done by Teresa et al., [23] in Ethiopia on patient's satisfaction indicated that more than half of the respondents were satisfied with the general medical laboratory services provided. However, there were some suggestions provided by respondents to improve overall satisfaction, which included adequacy of sitting arrangement and cleanness of waiting area [23]. Another study done in Ethiopia stressed on the lowest mean rating of satisfaction that was given for cleanness of latrine and location of the laboratory in the hospital with mean rating of 2.15% and 2.17% respectively [18]. The overall degree of Patients satisfaction with the laboratory services was high but patient satisfaction was lowest with the sanitation and location of latrines in the laboratory. Thus the hospital administration and the laboratory department were suggested to make every effort to enhance patients' satisfaction, particularly in sanitation and location of the latrine in the hospital [18].

In a study done by Hailu et al., [19] in Ethiopia showed how 25% - 50% respondents were dissatisfied with issues concerning the laboratory which also included the cleanness of the latrine. The result showed that 19%, 22% and 21% of the respondents respectively complained that they could not locate the laboratory, cashier office and latrine easily, thereby lessening their satisfaction rates with the laboratory. This finding was supported by various studies that showed laboratory patients had low satisfaction level with latrine cleanness and accessibility, waiting areas lack sitting facility and were not clean [19]. This was also depicted in another study which was done by Teklemariam et al., [24] in Ethiopia; there was dissatisfaction from the patients due to low attention given for the activities outside the laboratory room where tests are conducted, work overload or other reasons. The importance of all laboratory environments on client satisfaction such as cleanness of latrine and location of latrine, which include the difficulty in searching the location of the latrine to provide specimens like stool and urine, were also reported as the lowest rating of patients' satisfaction [24].

***Theme 2- Analytical related factors*:**

The Analytical phase is the most critical phase of the three phases involved in laboratory testing. Analytical phase looks at the processing

of all the clinical samples that are received into the laboratory. The samples are received, sorted and registered at the Central Reception Area (CRA) during the Pre-Analytical phase, before they are passed onto the various departments for processing in the Analytical phase. It is vital to ensure that if quality results are to be achieved then all the discrepancies are well dealt with in the Pre-analytical phase, as this will ensure that testing phase will be at its optimal levels and appropriate turnaround time of test will be achieved. To ensure that the analytical phase is prone to less errors, many steps are taken to ensure this as a study done by Agarwal et al., [25] in Delhi touches on an integral aspect which aids in reducing errors in the analytical phase. The number of laboratory errors in the analytical phase has decreased dramatically [25]. These drops are not only due to the increasing automation of laboratory processes but also as a result of the introduction of the External Quality Assurance Program (EQAP) & Internal Quality Assurance Programs (IQAP) to assess the quality of testing results. Improvements in the clinical laboratory have been made possible by the development of new procedures and techniques and the modification of existing techniques. Automated instruments are mostly used for testing in fields such as biochemistry, hematology, immunology, and genetic testing. The introduction of automation into testing processes has reduced the number of steps requiring human manipulation; also, the integration of computer hardware and software into analyzers has provided automatic process control and data processing capabilities [25].

Additionally, the laboratory must carry out validation of all analytical procedures to establish that the performance characteristics of the method(s) in question meet the requirements for the intended analytical application [25]. A study done by Alavi et al., [9] in Pakistan, where analytical errors that have been the focus of research in the past account for less than 10% of all the diagnostic mistakes. There are some issues which are evident today that needs to be addressed. Insufficiency of stocks, Availability of test and Turnaround of test results are very important aspects which need to be addressed to provide optimal service to customers [9].

1. Turn Around Time of Tests (TAT), Results Notification and Reporting:

Turnaround time of test includes all the steps from when the sample is received into the laboratory to when the results are sent out to physicians. A study done in Ethiopia shows that patients` satisfaction level towards TAT between 1-2 hours was about 5.3 times more likely than those patients awaiting their laboratory results for more than 2 hours [23]. Although timeliness of results reporting has not been a major focus in clinical laboratories, there is increasing pressure from clinicians to report results rapidly [23]. There are only sparse data, indicating that timeliness in reporting of laboratory results undoubtedly affects clinician and patient

satisfaction as well as length of hospital stay. Improving TAT is a complex task involving education, equipment acquisition, and planning. All the steps from test ordering to results reporting should be monitored and steps taken to improve the processes [26].

Apart from providing test results in a given time frame and meeting the turnaround time which are set, it is equally important to give accurate and quality results. The proper reporting process and the notification of results to the requesting physician is very important, as this diagnosis process of the patients are based on the results which are provided by the laboratory. There are at times when the paper based records are lost or do not reach the appropriate departments which causes delays in the treatment process of patients. In addition, there are delays associated with electronic based records in terms of internet connection and unavailability of reporting platforms at all health based facilities. A study done by Alelign et al., [5] in Northwest Ethiopia, mentioned the odds of patients who had never misplaced their laboratory results, were 2.1 times more likely to be satisfied with the service than those who had missing results. This is probably due to patients who were susceptible to unethical additional service fee and long waiting time to get results with associated delay in getting the clinical health provider service [5].

A study by Hailu et al., [19] in Ethiopia, showed how the pre-analytical phase affects the analytical phase. The result shows that (88.31%) of the respondents were not informed or aware of how long it takes to get the test result (turnaround time), while the remaining respondents were well informed about the laboratory turnaround time. Of these informed patients, 29.8% of them did not receive their result within the set turnaround time. Thus, it is very important to monitor TAT, as it is an ideal choice of activity to illustrate the laboratory's commitment in providing a high quality service. Improved TAT is key in providing client satisfaction in the laboratory [19]. A similar study also done in Ethiopia, showed that the highest rate of satisfaction was observed on timely test results for the human immunodeficiency viruses (HIV)/ Acquired Immunodeficiency Syndrome (AIDS) patients care [24]. However, the lowest rate of satisfaction was observed on critical value notification and on reporting of incomplete test results. Thus, it is very important that the laboratory heads and technicians have stringent process of reporting and realising of patient's records. They are to be treated with utter most confidentiality and must only be disclosed to the patient and the attending physicians [24].

2. Laboratory Standards and Protocols:

In a clinical laboratory setting operation there should be standards and protocols such as, seeing patients, process samples and provide results. This generally looks at the credibility of the laboratory, apart from this if the laboratory has set laboratory standards then the patients will have confidence in their results and treatment process. Currently in the developing

pacific islands clinical laboratories are using Laboratory Quality Management System (LQMS) [27]. This is a twelve element based guide which help shape up the laboratory and improve quality management of a public health or clinical laboratory. They are based on both the International Organisation for Standardization (ISO) 15189 and Clinical and Laboratory Standards Institute (CLSI) GP26-A3 documents [27]. A quality management system can be defined as "coordinated activities to direct and control an organization with regard to quality". This definition is used by the International Organization for Standardization (IOS) and by the Clinical and Laboratory Standards Institute (CLSI). When all of the laboratory procedures and processes are organized into an understandable and workable structure, the opportunity to ensure that all are appropriately managed is increased [5].

The quality model is organized into 12 (Organization, Personnel, Equipment, Purchasing and Inventory, Process Control, Information Management, Documents and Records, Occurrence Management, Assessment, Process Improvement, Customer Service and Facility and Safety) quality system essentials laboratory. These quality system essentials are a set of coordinated activities that serve as building blocks for quality management [5]. Under the twelve components of LQMS, assessment- external quality assessments, norms and accreditation are very important for a laboratory. These audit guidelines look at how the laboratory provides its service to its patients and customers and how they manage the complaints and issues which are raised [28].

In 2003, Pacific ministers of health created the Pacific Open Learning Health Net (POLHN). POLHN aims to ensure that health workers have access to the continuing professional development that they need. POLHN also builds capacity among local and regional academic institutions to develop and deliver online, continuing professional development programmes. This includes, since 2006 an online Diploma in Medical Laboratory Science for Pacific laboratory. Apart from this Pacific Paramedical Training centre (PPTC) also provides on-site support in (LQMSs training and auditing with WHO training tools and PPTC materials. Currently, Marshall Islands, Nauru, Solomon Islands, Vanuatu, Cook Islands, Fiji, Kiribati, Samoa, Tonga, American Samoa and the Federated States of Micronesia are part of the programmes being offered by PPTC and POLHN in collaboration with the WHO. PPTC continues to provide its External Quality Assurance Programme (EQAP) to 69 laboratories in 20 countries in the Asia Pacific region [29]. Adherence to such quality standards and participation in accreditation programs that certify this adherence can improve operational efficiency and customer service and reduce rates of laboratory errors. While there are limited published data that directly link accreditation to reduced laboratory errors and patient outcomes, studies have clearly shown that participation in

Proficiency testing (PT) programs, a key component of accreditation, leads to more accurate test results. For example, participation in just 3 rounds of an external Cluster of differentiation 4 (CD4) PT program resulted in 26% to 38% reduction in errors in the CD4 count among laboratories in resource-limited settings [40].

3. Sufficient Stocks and Availability of test:

In order for a clinical laboratory to function and provide service it is very important that the particular laboratory ensures that they have sufficient stock of all the reagents, kits and consumables which are used to perform the prescribed test. A study done in California identified about 15 to 45 % of the clinical laboratory operating budget is spent on supplies [32]. Given the size of expenditure, laboratory managers must pay close attention to the supply chain and develop effective strategies to manage their inventory. Areas that need analysis include the carrying cost of supplies, the cost to generate a purchase order, methods to efficiently count supplies on hand, processes to ensure that lot number items are used before their expiration, and detailed analysis of the inventory [32].

Purchasing and inventory management is a critical, or essential, component of the quality management system. Efficient and cost-effective laboratory operations need the uninterrupted availability of reagents, supplies, and services. Inability to test, even for a short time, is very disruptive to clinical care, prevention activities, and public health programs. Quantification is also a very important process that can help calculate how much is required of any particular item for a given period of time, and it is an essential part of a successful inventory management program [5]. At times due to insufficient stocks, test is unavailable to patients. This disrupts services and also delays the treatment process for patients. A study done by Kuupie et al, [33] in Ghana, Africa shows how poor supply chain management and stock-outs affects services. Adequate supply chain management prevents diagnostic test stock-outs and sustains Point of Care (POC) in diagnostic services in rural health facilities. Supply chain management has been defined by various studies to include all activities leading to the production, selection, quantification, negotiation, procurement, quality assurance, storage, inventory management, distribution and redistribution of a service or product [33]. There is poor supply chain management of POC diagnostics in the Upper East Region's rural Primary Health Care (PHC) clinics. The audit results in the study had shown higher deficiencies in inventory management and human resource capacity for POC diagnostic services in audited PHC clinics in rural Upper East Region's (UER) [34].

***Theme 3- Post-analytical related factors*:**

The Post-analytical phase is the most crucial phase of the total testing process and involves

evaluation of laboratory test results; release of test results in a timely manner to appropriate individuals, particularly critical results; and modification, annotation or revocation of results as necessary to support clinical decision-making. The frequency of laboratory errors during the post-analytical phase is lower than the frequency of errors during the pre-analytical phase, yet the post-analytical phase accounts for nearly one quarter of the entire laboratory process [32]. The post-analytical phase can be further divided into a phase inside the laboratory and a phase outside the laboratory (post-post-analytical phase). The post-post-analytical phase refers to procedures in which a physician makes medical decisions based on laboratory test reports in order to provide timely and effective patient care. In the post-analytical phase all test results that are not confirmed and released immediately upon analysis as part of the automated selection and reporting of test results must be evaluated through two mutually independent activities: review and confirmation of test results [32].

The review of test results begins by comparing the results with reference intervals and/or critical results, diagnoses and previous test results, if available. After this comparison, the results are confirmed as acceptable, or additional procedures are recommended, such as repeating the test with remark results from device, diluting the sample if the results fall outside the measuring range, or confirming unexpected results using the same or a new sample. If additional procedures give unacceptable results, the laboratory test report is released without the unacceptable (controversial) result, together with an explanation in the “Comments” area about why the test results are invalid and what further procedures are recommended. The review of results in the post-analytical phase may reveal mistakes or new problems in both the pre-analytical and analytical phases (such as sample misidentification, which is part of the pre-analytical phase but is very often recognised post-analytically). The test results must be reported accurately, clearly and unambiguously in a manner consistent with the specific instructions in the test operating procedures. The laboratory must define a format of laboratory results, whether electronic or paper based, and the manner in which they are released from the laboratory [32].

A study done by Sikaris et al., [35] at the University of Melbourne stated how ideally, the quality of laboratory report should be judged on its ability to answer the question(s) in the clinician’s mind when requesting the test on that patient. Both quality analytical data and the interpretation of that data against the clinical context of that patient are crucial to quality in post-analytical interpretation. The quality of the post-analytical phase also reminds us that clinical laboratories should primarily aim to be clinically effective, by supporting clinical decision-making and ensuring improved outcomes for patients [35].

1. Results Reporting & Notification (Format & Accessibility):

The most important part of the post-analytical phase is the results reporting and notification of results to the physicians. Results are important for the physicians to make a clinical diagnosis of patients and to administer the appropriate management. Thus it becomes crucial for the laboratory to ensure that the results released are of optimum quality and easy to interpret. There should be a proper format to which the results are laid out and the way it is set. Apart from this it is equally important that results are easily assessable to the physicians to fast track there treatment process. A study by Krleza et al., [32] in Croatia states that the most important attributes of the laboratory test report are the use of recommended, standardised language and syntax and the presence of all administrative and patient identification data, measurement results and confirmation data. Where appropriate, the report should also include comments necessary for interpretation of the test results and references and details for highly differentiated laboratory procedures. Comments are added only to improve the clinical value of the results and influence further diagnostic procedures or differential diagnosis. Comments that do not provide additional value to the results should be avoided, so it is easy for patients and physicians to understand and interpret results [32].

The authors also stated that the laboratory test report should use the terms “reference interval”, “therapeutic interval”, “recommended values” and “cut-off values” in accordance with the Croatian Chamber of Medical Biochemists (CCMB) guidelines [32]. The laboratory test report does not need to indicate the names of those who performed the sampling, received the sample in the laboratory or those who performed the analysis. However, this information should be recorded in the Laboratory Information System (LIS). An electronic overview of the laboratory test report should bear one of the following statements (or similar): (a) This laboratory test report has to been printed from the laboratory information system and is legally invalid without a stamp or signature.”; (b) “This is a printed copy of a laboratory report that is archived electronically and can be reproduced.”; (c) “This is a printed form of an electronically authorized laboratory report.”; or (d) “This is a laboratory test report printed from the laboratory information system.” It is necessary to indicate the place and time where a printed version of the laboratory report with authorised signature can be obtained. The laboratory test report can be released in electronic and/or printed form. LIS is usually connected to a hospital information system (HIS), laboratory test reports that have been confirmed can be printed out or sent electronically [32]. All this information ensures that patients will understand and also be able to interpret results better.

2. Availability of Staff to answer question and waiting time:

Patients' satisfaction with clinical laboratory services is essential as laboratory service plays a key role in patient management. Under-utilisation which could be due to dissatisfaction of clinical laboratory services can contribute to a worsened state of morbidity or mortality among patients. Information on satisfaction with clinical laboratory services is essential for policy and development of interventions to improve patient's satisfaction [36]. In the clinical laboratory setting is it important for staff to be well informed of the working procedures and be prepared for instances where results interpretation is needed. A study by Abera et al., [37] showed the ability of the laboratory personnel to answer questions on laboratory procedures and results, maintaining privacy and confidentiality of patient results which is about (83.2%) [37].

Another factor is that the technicians answering the phone only focus on client services duties, not specimen processing, or phlebotomy, or other questions or quires in regards to the laboratory. Being able to resolve issues efficiently and correctly requires that information be readily accessible and at the representatives' fingertips. This is probably the most difficult to attain because it requires the efforts of the Information Technology department and the testing sections, but once the information is in place it can be updated and it contributes tremendously to the overall efficiency of the services provided by the laboratory [38]. Waiting time is an important determinant of quality services as it is noted that in health care provision 'delays are expensive, not only in terms of direct costs incurred, but also in terms of the potential costs of decreased patient satisfaction and adverse outcomes' [39].

APPLICATION FOR PACIFIC NATIONS:

Based on these findings of this review, it can be said that patients' perception can greatly influence the utilization of laboratory services. Factors that have been found to facilitate the utilization of laboratory services include laboratory technician who display great professionalism, safe clinical settings, and good laboratory services in terms of short waiting time and accessibility of laboratory services. Overall, the importance of laboratory services in the developing pacific island countries cannot be ignored.

Moreover, currently not all pacific island countries are part of the external quality assessment programmes. Adopting the Laboratory Quality Management System (LQMS) and ensuring the laboratories are audited both by internal bodies and external bodies using the Stepwise Laboratory Improvement Process towards Accreditation (SLIPTA), is the way forward for all the laboratories in the pacific as these are World Health Organization (WHO) supported initiatives to raise standards and provide quality results to patients and customers.

In addition, the Pacific islanders' perception towards patients' perceptions on facilitators and barriers of utilization of clinical laboratory services must also be investigated. Such as study will provide the ideal foundation from which laboratory policies and strategies can be implemented and enforced. The ultimate goal of these surveys and analysing perception will be to bring in improvements in laboratory services in the Pacific and to improve the quality of life.

CONCLUSION:

In conclusion, the clinical laboratory is one of the important departments in the medical field which supports the diagnosis process of patients. The three phases are inter related to ensure that optimum quality of results is given out to the patients and customers of the laboratory. In order to have optimum quality level of results, the laboratory must ensure a few critical points. These points are competency and knowledge, patient interactions, service provided, availability of laboratory handbook, laboratory infrastructure and OHS, TOT, results notification and reporting, laboratory standards and protocols, sufficient stocks and availability of test, results reporting & notification (format & accessibility). These points form the core of the laboratory phases and if one these points are not looked into well it creates a delay in work and ultimately leads to dissatisfaction of the patients and customers as there will be delay in the overall service.

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AN AUDIT OF MATERNAL AND PERINATAL DEATHS SURVEILLANCE AND RESPONSE IN SOUTH WESTERN NIGERIA DURING CORONAVIRUS DISEASE (COVID-19) OUTBREAK

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ABSTRACT:
Maternal and Perinatal Deaths Surveillance and Response (MPDSR) are an evidence based practice that track, notify, review and make recommendation to prevent further maternal and perinatal deaths. These national efforts at mortality reduction may have been hampered by the outbreak of novel Corona Virus Disease-2019 (COVID-19) that prescribed movement restrictions, with some unprecedented negative effects on the health system. This study carried out an audit of MPDSR during COVID-19 outbreak in Southwestern Nigeria. An audit of the framework for institutionalizing MPDSR in Ondo and Ogun States was carried out in a descriptive cross sectional study using semi-structured validated checklist. The six thematic areas examined include case notifications, case reviews, meetings at State level, meetings at Health facility level, improvement actions following surveillance and reviews and joint supervisory visits. Data obtained was analyzed using the Microsoft excel software. More number of deaths was notified on the online platform compared to the paper reporting system. Percentage review of notified cases through the paper/form submission system was negligible for both maternal and perinatal deaths, it is worse in Ogun State during total lockdown. Statutory meetings at both State and health facility levels could not hold. There were no joint supervisory meetings during this period. Conclusion, poor reporting of maternal and perinatal deaths characterized COVID-19 period. This calls for prioritization of MDPSR activities during emergencies, upgrade of the online notification system to accommodate reviews and commencement of virtual meetings.

Keywords: MPDSR, COVID-19, Movement restrictions, South-western Nigeria.

INTRODUCTION:

The death of a woman or her child is a tragedy, with huge impact on the well-being of the family and the society. Worldwide approximately 830 women die daily from preventable causes related to pregnancy and childbirth [1]. Fortunately global efforts have resulted in reduction of these deaths between 2000 and 2017 in partial fulfillment of the MDGs [2]. Nigeria like many other countries in the African region have recorded significantly high maternal and perinatal deaths compared to the developed world [3]. A significant proportion of these deaths in Nigeria go unnoticed or unreported to the health authorities due to weak surveillance systems as well as cultural and religious factors. Most reviews on maternal deaths in Nigeria were isolated facility-based reports which may not be generalizable for the population at large.

In 2013, Nigeria's Federal Ministry of Health directed all health institutions in the country to institute maternal death surveillance and response (MDSR) programmes [4]. Realizing the nexus between maternal and perinatal deaths, the latter component was added in 2016, resulting in the maternal and perinatal death surveillance and response (MPDSR) [5]. This is a cost effective approach which permits the routine identification, notification, quantification, mapping, and determination of causes and avoid-ability of all maternal as well as perinatal deaths [6]. This quality assurance and accountability mechanism could provide critical evidence of where the main problems lie and detailed information on various factors in the health system that needs to be addressed to reduce maternal deaths.

MPDSR programmes may have been hampered by the outbreak of the novel Corona Virus Disease-2019 (COVID-19) and the efforts to contain the pandemic since January when the country started preparing for managing the contagious disease. COVID-19 was reported to have been caused by SARS-COV2 which is an RNA virus that is capable of causing serious respiratory as well as multi-systemic disorders [7]. COVID-19 is a contagious infection. Avoiding person to person contact by physical distancing, use of Nose mask, respiratory and personal hygiene are some of the effective methods for reducing the transmission. The World Health Organization (WHO) is deeply concerned by its severity and unprecedented extent of global spread hence its declaration as a global pandemic [7&8]. There are widespread disruptions of the health systems due to the COVID-19 pandemic. Low and Middle- income countries (LMICs) can expect to see large increase in maternal and child deaths [9].

The first case of COVID-19 in Nigeria was reported in Lagos state, one of the states in Southwestern Nigeria on 27th February 2020. The patient was a 44 years old Italian traveller. NCDC Covid-19 update situation report [10]. The disease soon spread to Ogun state which shared boundary with Lagos, then Federal

Capital Territory (FCT) and Kano state within the first few weeks [11]. Before the end of March many other states in the country have reported cases of the infection. These included Osun, Oyo, Ondo and Ekiti states, all in south western Nigeria. There were 2 case fatalities from a total 139 cases before March ending [12]. Health workers are usually at the fore-front of any outbreak of disease such as the COVID-19 and as such, are exposed to higher risk of contracting the pathogens. In order to achieve control of the infection the Government of Nigeria was swift to respond in an unprecedented move by imposition of population lockdowns, curfews, and physical distancing as well as use of Nose masks [13]. Those exposed were quarantined and isolated while, health care workers (HCWs) were to use personal protective equipment (PPE) while attending to confirmed or suspected cases.

Though some research findings indicated that children and women of reproductive age appear to have low mortality rates from COVID-19 [14]; these groups might be disproportionately affected by the disruption of routine health services as a result of re-distribution of HCWs to take care of COVID-19 patients, particularly in LMICs including Nigeria [4]. This have a lot of implications for Nigeria, a country with maternal mortality ratio (MMR) of 512 deaths per 100,000 live births, a confidence interval for the 2018 MMR ranging from 447 to 578 deaths per 100,000 live births; and a perinatal mortality rate (PMR) varying from 40 to above 80/1000 live births [15] .

As restrictions are just being lifted in phases, despite increasing number of COVID-19 infections in the country, it is important to audit possible effects of the outbreak on MPDSR in order to plan for eventualities in the nearest future. This would also assist to circumvent observed challenges facing the MPDSR programme in Nigeria. This study carried out an audit of MPDSR during COVID-19 outbreak in Southwestern Nigeria.

METODOLOGY:

This descriptive cross-sectional study was carried out in Ogun and Ondo states in Southwestern Nigeria, between March and June 2020. The lockdown started on 30th March in Lagos and 6th April in Ogun. However, other states in the Southwest and the rest of the country entered lockdown at a later date. The MPDSR activities at the level of the States including quarterly state MPDSR steering committee meeting, bi-monthly state MPDSR sub-technical committee meeting, availability and submission of case notification and report forms amongst others were included in the study population.

Two out of the three States that commenced MPDSR at inception (Ogun and Ondo States) were randomly selected using ballot method. These States were active in MPDSR activities and have been regularly reporting until the COVID-19 lockdown when an audit was carried

out. For data collection a checklist validated by States Monitoring and Evaluation officers was used to collect data, as well as an audit of MPDSR activities. The checklist contained semi-structured questions to cover the following thematic areas: Case notifications, Case reviews, Meetings at State level, Meetings at Health facility level, Improvement actions following surveillance and reviews, Joint supervisory visits.

Ethical approval for this study was obtained from Ogun State Primary Health Care Development Agency PHCDA ethics review Board, and further permission from the coordinating agencies in the two States. Data obtained was analyzed using the Microsoft excel software and presented as frequency distribution tables.

RESULTS:

Table 1 shows the pattern of notification and review of maternal and perinatal deaths between March and June 2020. From March to April in Ogun State, zero maternal death was notified through forms submission compared to 7 cases notified through the online platform. Likewise only one perinatal death was notified through the forms submissions as compared to 71 cases of perinatal deaths notified through the online platform. Thus, far more cases were notified on the online platform compared to the paper reporting system. Percentage review of notified cases through the paper/form submission system was negligible for both maternal and perinatal deaths within this period in Ogun State, since currently the online reporting does not carry review.

From March to June in Ondo State, a total of four maternal deaths were notified through forms submission compared to 6 cases notified through the online platform. Likewise a total of 20 perinatal deaths were notified through the forms submissions method as compared to 37 cases of perinatal deaths notified through the online platform. Thus, far more cases were also notified on the online platform compared to the paper reporting system. Though all cases of notified maternal deaths were reviewed, only 11 of the 20 notified perinatal cases were reviewed through the paper forms submission system between January and April 2020.

Table 2 shows the effects that the lockdown and movement restrictions have on MPDSR processes in the 2 States. In both States, MPDSR was not on the priority list as essential hospital services during COVID lockdown. The quarterly state MPDSR steering committee meeting could not hold, likewise the quarterly state MPDSR sub-technical committee meetings. The State MPDSR quarterly technical review and validation meeting could not hold for both States. In both states, notification and review forms were only partially available to the health facilities; and as such, hard copy notification and review forms were only partially submitted to the State coordinating agencies. Health facility MPDSR committee review meetings partially held in many facilities in both States. However, health facilities were able to

partially carry out planned improvement and surveillance activities. For both States, the Quarterly MPDSR/other Reproductive Health RH programmes joint supervisory visit to Health Facility HF could not hold to review MPDSR performances, while the quarterly HF, MPDSR capacity building & sensitization rounds could not hold in both States, community MPDSR outreaches, meetings could also not hold. Some services such as Other RH services such as antenatal care, postnatal care and family planning were all slowed down.

Table 1: Pattern of notification and review of maternal and perinatal deaths

Variables	Surveillance Activity	Ogun State		Ondo State	
		MARCH/APRIL 2020	MAY/JUNE 2020	MARC/APRIL 2020	MAY/JUNE. 2020
Hard copy/paper notification and Review					
Maternal deaths	Notification	0	0	3	1
	Review	0	0	3	1
Perinatal deaths	Notification	1	0	14	6
	Review	1	0	8	3
Online notification					
Maternal deaths	Notification	6	1	3	3
	Review	-	-	-	-
Perinatal deaths	Notification	37	34	18	19
	Review	-	-	-	-

Table 2: Effect of COVBID-19 outbreak and restrictions on MPDSR processes

MPDSR processes	Ogun State	Ondo state
OMPDSR prioritized as essential hospital services during COVID lockdown	1	1
Quarterly state MPDSR steering committee meetings held	1	1
Bi-monthly state MPDSR sub-technical committee meetings held	1	1
Quarterly State MPDSR TR and validation meeting with HF held	1	1
State/HF focal persons MPDSR M and E review meetings held	1	1
HF MPDSR committee review meetings held	2	2
Are notification and review forms always available for HF use	1	3
Hard copy notification and review forms submitted by HF to State	1	1
HF preventive and improvement actions held as planned	2	2
Quarterly MPDSR/other RH programmes joint supervisory visit to HF held	1	2
Quarterly HF MPDSR capacity building & sensitization done	1	1
Planned Government commitment and MPDSR related programmes held	2	2
Community MPDSR outreaches, meetings held and report submitted	1	1
RH unit activities affected or was at standstill:		
ANC	1	2
PNC	1	2
Family planning	1	2

Keys to the scorings: Yes=3, Partially=2, No=1

DISCUSSION:

Maternal and perinatal death surveillance and response (MPDSR) was adopted in Nigeria by FMOH in 2016 with sole purpose of reducing preventable deaths of both mother and baby. The operational model of MPDSR is a six actions cycle, identification of death (maternal and perinatal) collect information and reporting, reviewing, making recommendation, implement recommendation and finally evaluate [16]. MDPSR report format has basically hard copy/paper form and electronic forms were recently introduced to fasten notifications.

The findings in the study showed a disruption of reporting in two states with Ogun performing worse from March to June 2020. The poor performance can be seen in the reports. This is inconsistent with State level reports of the past three years most especially in Ogun State [17]. Where MPDSR has been institutionalized and reporting systems are regular. This pattern is not surprising because Ogun State experienced total lockdown for the majority of the period under consideration.

This study also shows that the recently introduced soft copy platforms ("Whatsapp" reporting) has bailed out the MPDSR system at a time that the hard copy forms could neither be filled nor submitted to the monitoring and evaluation M and E office due to COVID-19

movement restrictions. The limitation of this online platform is its inability to report reviews but can notify. This calls for the development of MPDSR specific application (app) and that a review mechanism should be enabled for the online platform after due capacity building for the designate HF statutory MPDSR support officers. Poor hard copy reporting could also emanate from the inability of most health facility to have a dedicated staff for MPDSR, who would notify immediately and pave way for reviews and submission of forms. The development of a MPDSR specific app and its deployment to the high volume sites for a start is not out of place. A better but guided access should also be installed to accompany this online reporting platform.

The inability of the various statutory MPDSR meetings to hold simply means that the State MPDSR coordinating mechanism was disrupted. This was not only connected to movement restrictions but also because of the need to observe Government stipulated public health control measures most especially social distancing in order to prevent the spread of COVID-19, a disease that spread by droplets [18]. in a human to human transmission. Some of the major implications of the reported negative effects of COVID-19 disease are under reporting in maternal and perinatal deaths in terms of review and notification and delay in instituting improvement and preventive actions at both the health facility and State coordinating levels. Poor reporting and poor documentation has been documented as among the challenges of audit exercise in the health system including MDPSR, the pandemic only made it worse [17, 19 & 20].

The negative effects of no movement could also be felt in other aspects of reproductive health care service delivery as it affects some services such as ante-natal care, postnatal care and family planning. This is a reflection that MPDSR was not a priority service during emergencies. However, MPDSR is a quality care enhancing project in Health care service delivery and should be prioritized both by law and in practice [21, 22]. No doubt restriction of mobility is evidence based preventive health action for COVID-19, a contagious infection [18, 23]. However, its implementation must be such that it will not impact negatively on other existing important health programmes such as MPDSR.

Joint supervisory visits by leadership of different units of MPDSR are important for coordination, to monitor and evaluate the programme, the same practice should be extended to other RH services such as HIV/AIDS, family planning, immunization and nutrition programmes. Inability of supervisory visits and meetings to hold during the lockdown period underscores a dire need to prioritize MPDSR exercise in the post lockdown period.

The health workers trained in MPDSR program who have been transferred to COVID-19 and related acute emergency services units, may need to be returned to the program or more staff are trained as replacement.

CONCLUSION:

This report demonstrated that MPDSR and probably other RH services suffered poor performance during COVID-19 pandemic lockdown. This calls for prioritization of MPDSR and a careful assessment of implication of new health care measures on the existing programmes in the future. There is a need to upgrade the recently introduced online notification system to accommodate reviews or better-still develop a MPDSR specific app and utilization of virtual meetings.

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RETROSPECTIVE ASSESSMENT OF THE PREVALENCE OF TRAUMATIC BRAIN INJURY AMONG PATIENTS REFERRED FOR COMPUTED TOMOGRAPHY SCAN AT PORT MORESBY GENERAL HOSPITAL, PAPUA NEW GUINEA

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ABSTRACT:
Traumatic brain injury (TBI) remains one of the serious health and socioeconomic problems throughout the world. It affects people of all ages; however, adolescents, young adults and the elderly are mostly affected. It is prevalent in both developing and developed countries. However, the greatest burden of TBI is experienced in the low and middle income countries (LMICs). This study is a retrospective assessment of TBI among patients referred for computed tomography (CT) scan at the Port Moresby General Hospital (PMGH) over a period of 28 months (September 2017 to December 2019). The case files of all the TBI patients were collected after obtaining ethical clearance. The relevant information was recorded in Excel Spread sheet. A total of 647 cases were recorded. The data was statistically analyzed using Microsoft Excel 2013. More than 50% of the cases were young adults, followed by adults in the age range of 35-64 years. Motor vehicle accidents (MVAs) and assaults were the leading cause of TBI. Male outnumbered their female counterparts with the ratio of 4:1. We cannot conclude that MVAs and assaults are the common cause of TBI in PNG currently, because no standardized data recording is available.

Keywords: traumatic brain injury, head injury, adolescent, young adults, elderly patients, epidemiology, Papua New Guinea

INTRODUCTION:

Traumatic brain injury (TBI) also known as head injury (HI) or head trauma (HT) is one of the leading causes of death and disability worldwide [1-4]. TBI is referred to as “silent epidemic” [3, 4, 8] because the problems resulting from TBI may not be directly visible. The term TBI is non-specific because it includes clinically obvious

external injuries to the face, scalp and calvarium such as laceration, contusions and fractures [12]. TBI is defined by Common Data Elements (CDE) as an alteration in brain function or other evidence of brain pathology caused by an external force such as blast or explosion, firearms, or Motor vehicle accident (MVA) or road traffic accident (RTA) [4, 12]. Assaults such as interpersonal violence, street fight, tribal fight or firearms are common in economically depressed or resource poor countries [9]. MVA and RTA are prominent causes of TBI in both developed and less developed countries [4, 8]. However, MVA or RTA related TBI in some developed nations have declined due to adequate traffic educations and traffic safety regulations [4]. Alcohol consumption or drug intoxication in developed countries represent an important risk factor of TBI and is suggested to be the contributing cause in up to 50% of hospital admission to intensive care unit (ICU) [4, 8].

TBI affects people of all ages, though adolescent, young adults and the elderly are predominantly affected [3-4]. Millions of people in the United States of America (USA) and European Union (EU) incur TBI every year. Approximately 5.3 million and 7.7 million people in the USA and EU respectively, are living with TBI related disability [4]. Papua New Guinea (PNG) and other countries are facing the same problem. Low- and middle-income countries (LMICs) such as PNG experience the burden of TBI more than high-income countries [4]. However, epidemiological data in the developing countries are scanty [4] thus the actual number of people who died or live with TBI related disability is not known. MVAs, RTAs, falls and assaults are the common causes of TBI that are well documented [4-7]. Greater variability however, exists across regions of various population, regulations and infrastructure [4, 8]. For example, in a low-income country such as PNG, MVAs and assaults are common whereas in high-income countries such as the USA or Australia, fall related TBI is common.

In PNG, published data on TBI is scanty. Two hospital based studies published in 1996 [6] and 2007 [9] reported that TBI is among the common causes of death and hospitalization. The results also indicated that MVA and assaults were the leading cause of TBI related death and hospitalization among young adults and adolescents [6]. Moreover, MVA was the leading cause of TBI in Goroka and overall in Port Moresby. Another study conducted in PMGH over a two-year period (2003 to 2004) on the trends in TBI outcomes demonstrated that assaults have overtaken MVA as the leading cause of TBI with a margin of 47% and 31%, respectively [9]. Other common causes of trauma related cases for surgical admissions reported in the Southern Highlands of PNG were tribal fights (24%), domestic violence (14.3%), assault (16.7%), road accidents (14%) and domestic accidents (25.1%) that included falls,

penetrating wounds and bites [18]. In some areas in PNG, falling from trees or coconut trees contributed to TBI [19].

PNG is located north of Australia in the South Pacific region. It shares land border with West Papua (Indonesia) to the west and an ocean border with Solomon Island to the east and Australia to the south [13]. It has an estimated population of over 7 million, of which 80% of the population lives in the rural areas [13].

The major objective of this study was to retrospectively assess the prevalence of TBI among the patients referred for CT scan at the PMGH over a period of 28 months (September 2017 to December 2019).

METHODOLOGY:

This was a descriptive study with convenience sampling conducted at the PMGH Radiology Department [14-15]. The PMGH is the major public general, specialist and reference hospital in the National Capital District (NCD) and PNG. It is also the teaching hospital for the School of Medicine and Health Sciences (SMHS), University of Papua New Guinea (UPNG). The patients represent a cross-section of the NCD population and the Central Province.

Cases of TBI were collected retrospectively from the CT record book from September 2017 to December 2019. The variables collected were gender, age and recorded cause of TBI. The data were recorded in Microsoft (MS) Excel Spreadsheets.

Patients whose age ranged below 10 years were excluded in this study. A total of 803 TBI cases were recorded. Of these, 156 cases were below 10 years of age, thus were excluded from the study. The final sample size was 647 cases of TBI. The data was analyzed statistically using the MS Excel Spreadsheet data pack version 2013.

Ethical approval for this study was granted by the School of Medicine and Health Science Research and Ethics Committee (SMHS REC). Written consent was granted by the Director of Medical Service at PMGH with the approval from the Head of Radiology Department.

Criteria for data analysis by age groups: Five categories of age groups were used in the present study [16]. Children: 10 to 14 years. Adolescence: 15 to 19 years. Young adults: 20 to 34 years. Adults: 35 to 64 years. Elderly: 65 plus years.

RESULTS:

Over the duration of 28 months a total of 803 TBI cases were recorded in the CT record book in PMGH. However, because of the exclusion criteria in the present study only 647 (80.6%) TBI cases were found suitable for analysis. Table 1 shows the distribution of all the patients according to age groups. The prevalence of TBI was highest (54.6%) among those in the 20 to 34 years age group, followed by (24.4%) those in the 35 to 64 years age group. The lowest prevalence (2.2%) was among those in the 65-

plus age group. Gender distribution indicated that 80.0% (518/647) were male patients and 20.0% (129/647) were female patients. The distribution of the male and female patients according to age groups is also presented in Table 1.

Causes of TBI among patient age groups:

The causes for 32.5% (210) of the 647 TBI cases were clearly stated in the CT record book. The most frequent cause was MVAs (52.4%) followed by assault (28.6%) and fall (15.7%). RTA accounted for only 1.9% of the TBI cases in the present study. These results are not the true reflection of the actual causes of TBI over the duration of the study because the causes of 67.5% (437/647) of the cases were not recorded (Table 2).

In terms of the distribution of causes of TBI among different age groups, the results revealed that young adults had the highest distribution of MVAs (54.5%), followed by adolescence (22.7%), children (13.6%) and adults (9.1%). Assault was the second common cause among young adults (75%), followed by adults (16.7%), adolescence (5%) and children (3.3%) with the least distribution. Fall was common among young adults (27.3%) while children, adolescence and adults had equal distribution of falls with 24.2% each. There was no recorded distribution of causes among the elderly patients (Table 3).

Table 1: % (n) distribution of all the patients according to age groups.

Age groups (years)	Males % (n = 518)	Females % (n = 129)	Total % (n = 647)
10 – 14	7.5 (39)	7.8 (10)	7.6 (49)
15 – 19	9.3 (48)	19.4 (25)	11.3 (73)
20 – 34	58.3 (302)	39.5 (51)	54.6 (353)
35 – 64	23.7 (123)	27.1 (35)	24.4% (158)
65 plus	1.2 (6)	6.2 (8)	2.2 (14)

Table 2: % (n = 210) distribution of causes of TBI among all the patients.

Causes of TBI	% (n)
MVA	52.4 (110)
Assault	28.6 (60)
Fall	15.7 (33)
RTA	1.9 (4)
Sports Injury	1.0 (2)
Suicidal	0.5 (1)

Table 3: % (n) distribution of causes of TBI according to age categories.

Age category (years)	MVA (n =110)	Assault (n=60)	Fall (n=33)	RTA (n=4)	Sports Injury (n=2)	Suicidal (n=1)	Total (n=210)
Children (10-14)	13.6 (15)	3.3 (2)	24.2 (8)	0	0	0	11.9 (25)
Adolescence (15-19)	22.7 (25)	5.0 (3)	24.2 (8)	25.0 (1)	0	0	17.6 (37)
Young adults (20-34)	54.5 (60)	75%.0 (45)	27.3 (9)	50.0 (2)	50.0 (1)	100 (1)	56.2 (118)
Adults (35-64)	9.1 (10)	16.7 (10)	24.2 (8)	25.0 (1)	50.0 (1)	0	14.3 (30)
Elderly (65 +)	0	0	0	0	0	0	0

DISCUSSION:

More than half (54.6%) of all the patients with TBI referred for CT scan in PMGH in the duration of this study were in the 20 to 34 year age group, which represents the young adults. This is a common pattern in most countries worldwide, where TBI is the common cause of death and disability among young adults [4, 16]. Our result also supports the findings in an earlier study by Kaptigau et al. [9] that TBI reported cases were predominant among young adults in Port Moresby. The authors also reported high incidence of TBI among adolescents. Our result however, shows relatively low prevalence (11.3%) of TBI among adolescents compared to the adults (24.4%).

In our present study 2.2% of the elderly are affected by TBI, this is lower that the values reported in the developed countries [2-4, 16]. The high prevalence of TBI among the elderly has increased in developed countries due to increase life expectancy and greater mobility as reported elsewhere [4]. Such results are quite true because, in PNG the life expectancy and mobility are lower than in the developed countries.

In terms of gender distribution in the current study, male predominance is seen; M/F ratio of 4:1. The result is higher than the M/F ratio of 3:1 reported by Kaptigau et al. [9]. The high prevalence of male with TBI has been reported by others [12]. Bruns Jr and Hauser [12] reported M/F ratio of 2.7:1, 2:1, 1.3:1 and >4:1 in Australia, France, China and South Africa respectively. A recent study by Peeters et al. [3] in 2015, reported that M/F ratio ranged from 1.2:1 to 4.6:1.

The high M/F ratio of TBI in the current study could be due to law and order issues; and limited policies and service provision targeting the problems. PNG is known for increased domestic violence and tribal fights and these activities are dominant among male individuals, especially young adults [6, 18].

The increase in motorization with inadequate traffic safety regulations and traffic education [4] may also have contributed to such increase TBI. This may also be the reason why young adults experience the burden of TBI than adults and the elderly. Thorough analysis and interpretation of the causes of TBI in the present study cannot be made because of the incomplete entry of relevant information in the CT record books in the Radiology department in PMGH. This should be of concern to the authorities because of the possibility of misdiagnosis and inappropriate management of patients. Urgent actions are needed to improve the information management and recording system in the Radiology department in PMGH.

However, based on the limited data available, which is 32.5% of all the cases recorded in the CT record book, MVA (52.4%) was the leading cause of TBI followed by assault (28.6%) and fall (15.7%). These results can be compared to two previous studies in PNG [6, 9].

In 1996 MVA was the leading cause of TBI followed by assaults [6]. However, in 2007 assaults was reported as the leading cause followed by MVA [9]. The trend is again reversed showing that MVA is the leading cause followed by assault.

In some developed countries, MVAs have declined because of adequate traffic education and traffic safety regulations [4]. In terms of age group, MVAs remain a major cause of TBI among young adults. This correlates with studies done elsewhere [2, 4, 8, 10]. Assaults are common in the LMICs as evidenced in the current study and also from previous studies [6,9].

Limitation of the study:

The data in the current study may not reflect the actual TBI trend in the NCD because of the inappropriate recording of information in the CT record book.

CONCLUSION:

The results indicated that TBI is prevalent among the young adults (54.6%) followed by adults (24.4%) and adolescents (11.3%). Prevalence of TBI was higher among the male compared to female patients with and M/F ratio of 4:1. The primary cause of TBI in the current study was MVA (52.4%) followed by assaults (28.6%). The incomplete entry of relevant information in the CT record books in the Radiology department in PMGH should be of concern to the authorities because of the possibility of misdiagnosis and inappropriate management of patients. Appropriate actions must be taken to improve the information management and recording system in the Radiology department in PMGH.

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LETTER TO THE EDITOR:

THE URGENT NEED FOR A POPULATION BASED BREAST SCREENING PROGRAM FOR THE EARLY DETECTION OF BREAST CANCER IN PAPUA NEW GUINEA

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Running title: *Central coordination is the key to developing a breast cancer screening in PNG*

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Dear Editor,

The continued rise in the incidence of breast cancer in Papua New Guinea (PNG) and the need for a coordinated approach to combat the burden of the disease has been acknowledged in the National Health Plan 2011-2020 [1]. The World Health Organisation (WHO) lists breast cancer as the female cancer with the highest incidence and the leading cause of mortality amongst women in PNG. In 2020, 1 570 new cases of breast cancer were diagnosed representing 23.2% of all cancers reported and 847 (11.6%) deaths [2]. It must however be recognized that the true incidence of breast cancer in PNG is unknown as even registrations at the new National Cancer Registry [3] do not accurately reflect the true rates of mortality and morbidity as surveillance remains ad hoc and many cancers continue to be undiagnosed and unreported [4].

Decreased morbidity and mortality from breast cancer in developed countries has largely been attributed to early detection through evidenced based population screening where mammography [5] is used as a screening tool to detect breast cancer in its pre-clinical stage in a targeted population. Though population screening is costly, the benefits of the early detection are well documented [6-8]. In established programs with participation rates of 85% or higher, mortality reduction has been reported at 40% [8-9]. Although desperately

needed, the challenge for PNG as a low resource country to implement such a program is large.

In PNG the National Cancer Control Program [10] is the vehicle used by the Government to support all aspects of cancer by overseeing; advocacy, data collection and analysis, prevention, early detection, diagnosis, treatment and rehabilitation. Notwithstanding the government's recognition of the problem in the National Cancer Policy 2015 [10] and commitment to turn policy into action through strategies such as the Cancer Action Priorities for 2017-2021 [4], very little progress has been made to date. Current Government and non-government efforts to progress and better manage the impact of breast cancer by raising public awareness through education, improving access to diagnostic and treatment services in PNG is commendable, but stagnated and not currently coordinated. The importance of addressing this issue and the need to establish a dedicated breast screening service in PNG is self-evident [11-16].

The first quasi population screening for breast cancer was undertaken by the Pacific International Hospital (PIH) between 2005 and 2009. Over 3000 women voluntarily undertook breast imaging, courtesy of a free screening program sponsored by the PNG Motor Vehicle Insurance Limited (MVIL), with a similar initiative currently sponsored by the PNG National Gaming Control Board (NGCB). Current access to mammography services is through the Port Moresby General Hospital (PMGH) and the PIH, both in the National Capital District (NCD). Mammographic imaging is also available at the Australian New Guinea Administrative Unit (ANGAU) Memorial Hospital; however this mammography unit is currently not operational due to technical faults. It is possible that other Provincial Hospitals may also provide mammography services within their radiology departments that we are not aware of and we acknowledge them for their service.

The burden of workload in PMGH combined with limited skilled manpower and substandard equipment means that implementation of a mass screening program with the current resources is simply not feasible. Additionally, the average PNG woman cannot afford the cost of diagnostic mammography at PIH when she presents with symptoms; let alone self-funded screening.

Without a dedicated program in place, the tireless efforts of government and non-government agencies to promote breast cancer awareness through various activities although commendable become counterproductive due to the lack of access to imaging services. Without access to imaging services increased education serves only to create anxiety and despair both amongst asymptomatic women wanting to act upon their raised awareness and engage breast screening or symptomatic women wanting to obtain a diagnosis. There is currently no pathway for women seeking either preventative health measures (mammography screening) or

diagnosis of disease through diagnostic imaging to follow, and no central coordination between all stakeholders to ease the burden of disease – likened to agenesis of the corpus callosum of the brain – *resulting in the non-coordination between the left and right cerebral hemispheres*. The Cancer Action Priorities for 2017-2021 states that moving forward an evidence base is needed to develop a comprehensive approach to the problem [4]. There is very little written on breast cancer from a PNG perspective outside of our research. Our peer reviewed and published papers are groundbreaking [17-20], a brief summary of our findings is outlined as follows:

The first study [17] examined the participation rates in the free program sponsored by PNG MVIL. In the snapshot of PNG women surveyed, low participation rates were seen to be influenced by various interrelated factors inherent in both the PNG environment and culture, in particular lack of transport infrastructure, financial burden and sexual harassment. As low participation reduces the effectiveness of population-based screening, any proposed program in PNG would need to address these substantive underlying issues which have been identified as significant barriers to participation.

The second study [18] reported for the first time the mammographic parenchymal patterns (MPPs) of PNG women, establishing an important baseline for future studies and informing breast cancer risk. Increased breast density is known to correlate with an increased risk for breast cancer and can inform the need for a more aggressive imaging regime. We however found that there was no unique distribution of MPPs in PNG women and therefore no increased risk of breast cancer based on the breast density profile of the women in our sample. Unfortunately, this result does not help to explain the high incidence of breast cancer in PNG but does support the use of routine mammographic imaging as the primary tool for breast screening.

The third study [19] investigated key risk factors for breast cancer and correlation with breast density. Results demonstrated that there was no clear relationship across almost all data. Factors that were weakly associated with increased breast density in PNG included parity, marital status, smoking, alcohol, and hormonal replacement therapy (HRT) use. Breast cancer risk was shown to be reduced for married women and those with increased parity suggesting a link to reproductive life.

The final study [20] investigated correlations between BI-RADS (a scoring system used in radiologist reports to describe the level of suspicion for cancer) category, age and MPP. Importantly, there was no correlation demonstrated between the high-risk BI-RADS categories 4 and 5 for breast malignancy and high-risk Tabár Type IV and V MPPs. The results of this study again reflect that the incidence of breast cancer in PNG cannot be explained by breast density. Results of this

study and other data indicate that any formalised screening program in PNG should have a target age group aimed at women younger than that of Western screening programs to capture women most at risk of breast cancer.

In conclusion, we support a continued push to see the realization of current government strategies on cancer priorities including breast cancer. The need for a population-based approach to the early detection of breast cancer in PNG is urgent. It is imperative that the PNG Government establish a service that is appropriately resourced and can be easily accessed by our women population and all relevant stakeholders if we are to make any future progress in easing the burden of breast cancer in PNG. To do this the current agenesis needs to be overcome, with any attempts to implement a breast screening program taking a collaborative approach and being supported through a partnership between the public and private health care systems.

Our research findings [17-20] have provided insight into breast cancer and mammography in PNG. It is our hope that these insights will be used to uniquely inform a national screening program for the women of PNG moving forward.

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