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An Empirical Analysis of Parental Age on Child Nutritional Status in Plateau State, Nigeria

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ABSTRACT

The nutritional status of children in any society is an indicator of good health and standard of living in any society. This study empirically examined the influence of parental age on child nutritional status in Plateau State, Nigeria. A cross-sectional survey design was employed, 200 participants were randomly selected from various health centers in the 17 Local Government Areas in the State for the study. Collection of data was done by distributing questionnaires and collecting Mid Upper-Arm-Circumference (MUAC) measurements by using a tape measure the best way to measure severe acute malnutrition. Pearson product-moment correlation was used to analyze the data collected with the aid of statistical package for social science (SPSS). The results r (200 = .863, p = .000) indicated that there is a significant positive relationship between parental age and children's nutritional status in Plateau State. The implications of these findings for policy are, preventing child marriage and reducing teenage pregnancy, empowering girls with information, skills, and support networks, and educating and mobilizing parents and community members among others recommendations were made.

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INTRODUCTION

Malnutrition among children in developing countries is a major public health concern since it places a heavy burden on already disadvantaged communities. Poor physical growth, an indicator of poor nutritional status, is high in sub-Saharan countries, where approximately 21.9% of

children are underweight and 40.1% are stunted (Black et al., 2008). The most vulnerable group of children are those under 5 years of age. Anemia, another indicator of poor nutritional status, is also widespread, with estimates indicating prevalence rates of 40–70% in Sub-Saharan countries. Both growth restriction and anemia in the early years of life increase the risk of mortality and morbidity and are associated with developmental and cognitive impairment (De Onis et al., 2004).

The link between poverty and poor nutritional status among children has been widely reported. Varying indicators of social-economic status (SES) such as maternal and paternal educational level, parental income, and family assets such as the ownership of land, quality of housing, and foods harvested among many SES indicators have all been associated with children's nutritional status (Kikafunda & Tumwine, 2006). Regardless of the method by which SES was estimated, its influence on a child's nutritional status was significant and consistent. It was observed that children from less advantaged families were more likely to experience growth restriction (i.e., stunting and being underweight) compared to their peers from more advantaged backgrounds (Arif, 2004). Despite this link, several factors give compelling reasons to carry out further investigation into the relationship between parental age and the nutritional status of children. One of the most salient reasons for this is the fact that the prevalence of stunting and being underweight has been found to show both between- and within-country variation in sub-Saharan Africa in general and in Nigeria in particular(Ene-Obong,2001). There is thus a need to examine the effects of parental age on the nutritional status of children in Plateau State Nigeria.

Worldwide, malnutrition is seen as a lack of access to highly nutritious foods, especially in the present context of rising food prices. Children and infants aged under five are highly vulnerable when it comes to malnutrition. Poor breastfeeding practices, offering unsuitable foods, and not ensuring that the child gets enough nutritious food are factors that contribute to malnutrition. Other health consequences such as infections – diarrhea, pneumonia, measles, and malaria – affect the child's nutritional status (WHO, 2014). In developing countries, malnutrition is one of the most important risk factors for high child mortality rates (WHO, 2014). Pregnant women and children are highly vulnerable to the consequences of malnutrition. Children in sub-Saharan Africa are 15 times more likely to die before the age of five than children in developed regions(WHO, 2014). One out of six children in developing countries show signs of being underweight, this points out a total number of 100 million children in the developing world (WHO, 2014). In almost every part of the world cases of malnutrition are declining, except for African countries. In large parts of Africa, the number of malnutrition rates does not change (Kikafunda & Tumwine, 2006). In Uganda, research from Kikafunda & Tumwine (2006) showed that many children, aged under five, have to deal with consequences of malnutrition such as diminished mental and physical capabilities.

Malnutrition is an overarching term that includes three different factors; stunting, wasting, and underweight. These three factors all have the same cause in common, they are induced by a deficiency of certain nutrients such as proteins and micronutrients (Caulfield et al., 2006)

A more recent study of Engebretsen et al. (2008). showed evidence for different determinants of malnutrition that are related to child growth. Distal factors such as wealth, land ownership, parental age, marital status, employment of both parents, and education of both parents are associated with (un)healthy growth of the child. Results of the study showed that wealth is the most important factor to predict malnutrition in children. Parental age plays a significant role in the nutritional status of the child, Children from under-age parents and older parents suffer malnutrition.

Yu, et' al (2016) investigated the differential effects of young maternal age on child growth in a sample of developing countries in Africa, Asia, and Latin America. Cross-sectional data from Demographic Health Surveys from 18 countries were used, to select the first-born child of mothers aged 15_24 years and a range of potential confounding factors, including maternal height. Child length/height-for-age z-scores (HAZs) were estimated in age bands of 0_11, 12_23, 24_35, 36_47, and 48_59 months; The effect of low maternal age on child height restriction from 0 to 11 months occurred in half the countries studied after adjusting for confounders. Poorer growth continuing after 24 months in children of younger mothers was observed in all regions but needs further research to determine the causes. The effects were about double (in stunting prevalence terms) in Africa, where there was an increase in 10 ppts in stunting for children of young mothers.

Novella (2013) studied Parental Education, Gender Preferences and Child Nutritional Status: Evidence from Four Developing Countries in Ethiopia, India (Andhra Pradesh state), Peru, and Vietnam. By adopting a methodology to disentangle gender differences produced by technology and preferences, the study finds evidence that the allocation of household resources varies with the gender of the child and the gender of the parents.it further showed that maternal power has larger effects on girls' health than on boys' health in Peru and Vietnam. In contrast, in India, maternal bargaining power has a negative effect on girls' health, whereas in Ethiopia no differential effect is found.

Umapathi (2008) examined Maternal education, childcare, and nutritional program in Madagascar. The study reveals that the height-for-age of children (a measure of chronic under-nutrition)with the most educated mothers in the participating villages improves by 0.141 SD and by 0.323 SD after five and eight years of program operation, respectively. The heterogeneity in effects on weight-for-age is less stark but statistically significant: impacts are greatest for the most educated subgroup. For the group with no schooling, the impact is not statistically significant for any period.

The above studies reviewed were carried out in foreign countries, the methodology used in carrying the research and the methods of data

analysis used are established gaps that this present study will fill

There is a high rate of underage marriage in Plateau State. It is against this background that this study will empirically investigate the impact of parental age on child nutritional status in Plateau State, Nigeria.

RESEARCH QUESTION

The following research questions were posed to guide this study;

i. What is the impact of parental age on children's nutrition status in Plateau State?
ii. What is the impact of parental education level on children's nutrition status in Plateau State?

HYPOTHESIS

The following hypothesis was formulated and was tested at 0.05 Significance levels.

i. Parental age in Plateau state does not have a significant relationship with the nutrition status of children.
ii. The parental education level in Plateau state does not have a significant relationship with the nutrition status of children.

REVIEWED OF RELEVANT LITERATURE

CONCEPTUAL FRAMEWORK

Nutritional status is defined as the evident state of nutrition of an individual. A person is said to have a good nutritional status if he shows no evidence of malnutrition, whether open or latent. Nutrition is the aspect of science that interprets the relationship of food to the functioning of living organisms. It includes the uptake of food, the liberation of energy, elimination of wastes, and the biochemical synthesis that are essential for the maintenance of normal growth and development (Laditan, 1983). The nutritional status of any person is his/her health as dictated by the quality of nutrients consumed, and the body's ability to utilize them for its metabolic needs. Thus, being nutritionally vulnerable, under-5 children's nutritional status is generally accepted as an indicator of the nutritional status of any particular community (Davidson et al., 1975). This is due to their easy susceptibility to malnutrition and infection (Uppal Kumari & Sidhu, 2005). Children in this age group require a high supply of nutrients since they are usually very active and their growth is rapid. Also during this period, under-nutrition in the form of kwashiorkor, marasmus, anemia, and xerophthalmia are not uncommon (Ene-Obong, 2001). It has been estimated that approximately one out of every three Under-5 children is chronically malnourished and thereby subjected to a pattern of ill health and poor development in early life (UNICEF, 1998), with malnutrition being associated with more than half of all deaths of children worldwide (Sobo & Oguntona, 2006).

THEORETICAL FRAMEWORK

Becker (1965) was responsible for putting “family” on the map of academic research in

economics in the 1960s. The simplicity and applicability of his models demonstrate the practicality of research at the household level (Grossman, 2003). Most studies on health and nutrition employ the Beckerian model of household utility where utility is derived both from purchased and home-produced goods (Arif, 2004; Chen & Li, 2006).

According to theory, households purchase goods and combine them with time into a household production function to produce commodities. The purpose of purchased goods and time is to serve as inputs to the acquisition of commodities, which, in turn, enter the household's utility function. For example, if the "quality of children" is a commodity, then related inputs might include food, vaccinations, schooling, and parental time. Another example of a commodity is "sleep," which would depend on the availability of a bed, house, and time. Information on inputs is thus essential to estimate the parameters of the production function. Inputs and outputs can often be jointly determined. For example, unobserved—i.e., to researchers—sick individuals are more prone to using health-related inputs, which could cause the estimated results of health inputs to be biased downward. The simultaneity bias caused by joint input-output demands can be removed by implementing instruments such as prices into the function.

MATERIALS AND METHODS

RESEARCH DESIGN

This research was based on a cross-sectional survey design. Surveys were used to gather information in all the 17 Local governments of Plateau State in different health centers within the state.

POPULATION

The target populations in this study were all infants and children aged under five years and their parents in Plateau State. The study sample 200 participants from various health centers in the state (N = 200). To determine whether or not parental age influences the nutrition status of the target population, both malnourished and non-malnourished children were incorporated in this study. Parents were asked to provide information about the determinants (parental age) and nutritional status of children. These two populations, children and their parent(s) are involved in the study.

DATA COLLECTION

To set up a database, the collection of data was done by conducting questionnaires and collecting Mid Upper-Arm-Circumference (MUAC) measurements. Assessment of malnutrition took place by measuring the Mid Upper-Arm-Circumference (MUAC) of the child. This method was used because it was impossible to obtain weight and height information through the health cards of the children. Most of the time, mothers forgot their child's health cards or the information was not up-to-date. The standards, a cutoff point of 115 mm for MUAC was used to determine severe acute malnutrition. Malnutrition was dichotomized and defined as YES or NO in cooperation with assistant researchers, who summarized the questionnaires administered in the different health clinics in Plateau State. Participants who

were able to speak English were responded to the questionnaire by assistant researchers. The dependent variable of this study is children's nutritional status. The independent variable is parental age, it was categorized into three groups (1) low-level, (2) mid-level, and (3) high-level. Paternal age level was measured by asking the last completed level of age via the mother. Ages between 12-18 are low level, 19-35 middle level 36 and above High level. Several possible confounding variables might influence the association between parental age and child nutrition status. Household income, Employment of the mother, Employment of the father, Child's age in months, Education of th mother/father

METHOD OF DATA ANALYSIS

When all data was collected, both the categorized determinant 'the parental age' and the dichotomized variable 'nutritional status of the children' was analyzed by a Pearson product-moment correlation. This analysis was done with SPSS version 23.

RESULTS

RESULTS OF HYPOTHESES TESTING

Hypothesis One: Parental age in Plateau state does not have any significant effects on the nutrition status of children.

Table 1: Pearson Product moment Correlation (r) of the relationship between parental age and children nutritional status

Variable	$\bar{X}$	SD	N	r-cal.	A	P	Decision
Parental age	2.30	1.190					
			200	.863	0.05	.000	Significant
Children Nutri. Status	1.36	0.48					

p< .05

The findings from Table 1 indicated that there is a significant positive relationship between parental age and children's nutritional status in Plateau state. Thus, the Ho has been rejected since r (200 = .863, p = .000) which implies also that the probability value (p) is less than the level of significance (0.05) used for statistical decisions. The positive nature of the relationship here implies that most parents that married early were not adequately prepared for parenthood

hence they could not provide the nutritional requirements for their children.

Hypothesis Two: The parental education qualification in Plateau state does not have any significant effects on the nutrition status of children.

Table 2: Pearson Product moment Correlation (r) of the relationship between parental education qualification and the nutrition status of children

Variable	$\bar{X}$	SD	N	r-cal.	A	P	Decision
Parental Edu. quali.	1.8	1.06					
			200	.693	0.05	.000	Significant
Children Nutri.Status	1.43	0.425					

p< .05

Table 2 showed that r (200 = .693, p = .000), which means that p<.05 and Ho has been rejected. This implies also that there is a significant positive relationship between parental educational qualification and the nutritional status of children in Plateau State, Nigeria. That as parents acquired more educational qualifications, the more he or she gets aware of food and their nutritional values that can provide a well-balanced diet for children. Educated parents are also aware of the benefits of a balanced diet for children's growth and development.

DISCUSSIONS

The recent economic recession has contributed to the fall in nutritional status in most households. The study reveals that there is a significant positive relationship between parental age and children's nutritional status in Plateau state. These findings agreed with the work of Yu et al. (2016) which concluded that the effect of low maternal age on child height restriction from 0 to 11 months occurred in half the countries studied after adjusting for confounders. Poorer growth continuing after 24 months in children of younger mothers was observed in all regions but needs further research to determine the causes. The effects were about double (in stunting prevalence terms) in Africa, where there was an increase in 10 ppts in stunting for children of young mothers. Most parents that had early marriage were not financially buoyant to provide adequate nutritional requirements for their children, especially in rural areas. Hypothesis two shows that there is a significant positive relationship between parental educational qualification and the nutritional status of children in Plateau State, Nigeria. This is because educated parents are aware of varieties of food that will meet the nutritional requirement of children than parents that are illiterates. These findings agreed with the work of Umapathi (2008) which concluded that the height-for-age of children (a measure of chronic under-nutrition)with the most educated mothers in the participating villages improves by 0.141 SD and by 0.323 SD after five and eight years of program operation, respectively. The heterogeneity in effects on weight-for-age is less stark but statistically significant: impacts are

greatest for the most educated subgroup. For the group with no schooling, the impact is not statistically significant for any time.

CONCLUSIONS

Concerning the main question of the research: What is the impact of parental age on children's nutrition status in Plateau State? and the hypothesis, which states that Parental age in Plateau State does not have a significant relationship with the nutrition status of children. Low maternal age was associated with low children nutritional status An increased maternal age level, mid and high age level decrease the chance of child malnutrition. This association is influenced by income, educational level of the father, and age of the child. Paternal education was positively related to child nutrition status based on the results of this research. This is because educated parents are aware of varieties of food that will meet the nutritional requirement of children than parents that are illiterates. The results suggest that the infants of mothers below 18years of age should receive particular attention, in Plateau State

POLICY IMPLICATIONS

The implications of these findings for policy can be viewed in several ways.

First, preventing child marriage and reducing teenage pregnancy are important for many reasons. Among the strategies that should be considered and that are effective are

1) Empowering girls with information, skills, and support networks;

2) Educating and mobilizing parents and community members;

3) Enhancing the accessibility and quality of formal schooling for girls; 4) offering conditional cash transfers economic and other types of incentives for girls and their families to remain in school; and

5) Fostering an enabling legal and policy framework to check early marriage.

LIMITATION OF THE STUDY

This study had some limitation, this limitation include;

Sample used: The sample of 200 participant used was inadequate, in and ideal situation the sample should be 10% of the population.

Questionnaire administered: The questionnaire administered to the participants suffered some setbacks as most participants (Mothers) cannot read and write in English especially in rural areas. Interview could have been the good option.

Method of Data Analysis and Results: The Pearson product moment was used for the data analysis and result presentations with the aids of SPSS software. There are other techniques that could be used like logistic regression, t-test and multiple regressions with different software like E-view, STATA and Smart PLS.

SUGGESTION FOR FURTHER STUDY

Based on the limitation of the study above, I suggested that the following study can be carry out.

An Empirical Analysis of Parental Age on Child Nutritional Status in Plateau State using large sample, interview, multiple regression with the aid of STATA software

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Research Article

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Public Health Importance and Its Issues

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ABSTRACT

Father of Public Health – John Snow- public health defined as "Art of preventing disease and improving quality of life through organized efforts of society, communities and individuals. The 10th amendment gives powers to state relating to public health. Acc to WHO – Public health to prevent disease, promote health, prolong life. Role of public to promote welfare of the entire population not individuals. The five pillars of public health are:1. Health education. 2. Biostatistics. 3. Environmental health. 4. Epidemology. 5. Health service administration. The 3 Ps of Public Health are:-1. Health Promotion. 2. Prevention of ill-health. 3. Health Protection. The police powers of public health are:-1. Quarantine. 2. Enforce isolation. 3. Inspection laws to spread of disease. The core functions of public health are:-1. Assessment. 2. Policy development. 3. Assurance. Public health to improve society: - "Social interaction is good for your brain health, promotes a sense of society and security". Health and society degree, jobs and careet paths:- 1. Cardiovascular Technician. 2. Anesthesia Technician. 3. Dental Hygine. 4. Occupational therapy assistant. 5. Physical therapy assistant. 6. Surgical Technician. 7. Registered Health Information Technician. Health and social care jobs:-1. Counsellor. 2. Social Worker. 3. Youth Worker. 4. Community development worker.

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Public health is "**the science and art of preventing disease, prolonging life, and promoting health through the organized efforts and informed choices of society, organizations, public and private communities, and individuals**.

Public health is **the science of protecting and improving the health of people and their communities**. This work is achieved by promoting healthy lifestyles, researching disease and injury prevention, and detecting, preventing and responding to infectious diseases.

8 synonyms, antonyms, idiomatic expressions, and related words for public-health, like: **epidemiology**, hygiene, sanitation, health policy, food-safety, cyber security, hygienics and health.

PURPOSES

The purpose of a public health intervention is to prevent and mitigate diseases, injuries and other health conditions. The overall goal is to improve the health of populations and increase life expectancy.

CHARACTERISTICS AND COMPONENTS

Public health is a complex term, composed of many elements and different practices. It is a multi-faceted, interdisciplinary field. For example, epidemiology, biostatistics, social sciences and management of health services are all relevant. Other important sub-fields include environmental health, community health, health economics, public policy, mental health, health education, health politics, occupational safety, disability, gender issues in health, and sexual and reproductive health.

- Modern public health practice requires multidisciplinary teams of public health workers and professionals. Teams might include epidemiologists, biostatisticians, physician assistants, public health nurses, midwives, medical microbiologists, pharmacists, economists, sociologists, geneticists, data managers, environmental health officers (public health inspectors), bioethicists, gender experts, sexual and reproductive health specialists, physicians, and even veterinarians.
- The elements and priorities of public health have evolved over time, and are

continuing to evolve. Different regions in the world can have different public health concerns at a given time.

- Common public health initiatives include promotion of hand-washing and breastfeeding, delivery of vaccinations, suicide prevention, smoking cessation, obesity education, increasing healthcare accessibility and distribution of condoms to control the spread of sexually transmitted diseases.

METHODS

- Newspaper headlines from around the world about polio vaccine tests (13 April 1955)
- Public health aims are achieved through surveillance of cases and the promotion of healthy behaviours, communities and environments. Analysing the determinants of health of a population and the threats it faces is the basis for public health.
- Many diseases are preventable through simple, nonmedical methods. For example, research has shown that the simple act of hand-washing with soap can prevent the spread of many contagious diseases. In other cases, treating a disease or controlling a pathogen can be vital to preventing its spread to others, either during an outbreak of infectious disease or through contamination of food or water supplies. Public health communications programs, vaccination programs and distribution of condoms are examples of common preventive public health measures.
- Public health, together with primary care, secondary care, and tertiary care, is part of a country's overall health care system. Many interventions of public health interest are delivered outside of health facilities, such as food safety surveillance, distribution of condoms and needle-exchange programs for the prevention of transmissible diseases.
- Public health plays an important role in disease prevention efforts in both the developing world and in developed countries through local health systems and non-governmental organizations.
- Public health requires Geographic Information Systems (GIS) because risk, vulnerability and exposure involve geographic aspects

ADVANTAGES OF PUBLIC HEALTH SPENDING

Increased healthcare spending aimed at improving quality of healthcare services results to a decrease in medical care expenses through increased and improved access to new technologies that provide for new treatment options and treatment for large number of individuals.

At local level, healthcare spending is beneficial because it creates employment for healthcare specialists, increases wages for health care

workers, expands local tax revenues and increases demand for related goods and services.

As the health sector becomes a greater portion of GDP, employment and related activities in health sector also grow. The national Bureau of Labour Statistics reveal that health sector employed 6.3 million practitioners and technical workers in by November 2003 (US Department of Labour, 2004), and a further 3.2 million Americans were employed in health care support occupations. The health sector is therefore a significant source of employment for America workers.

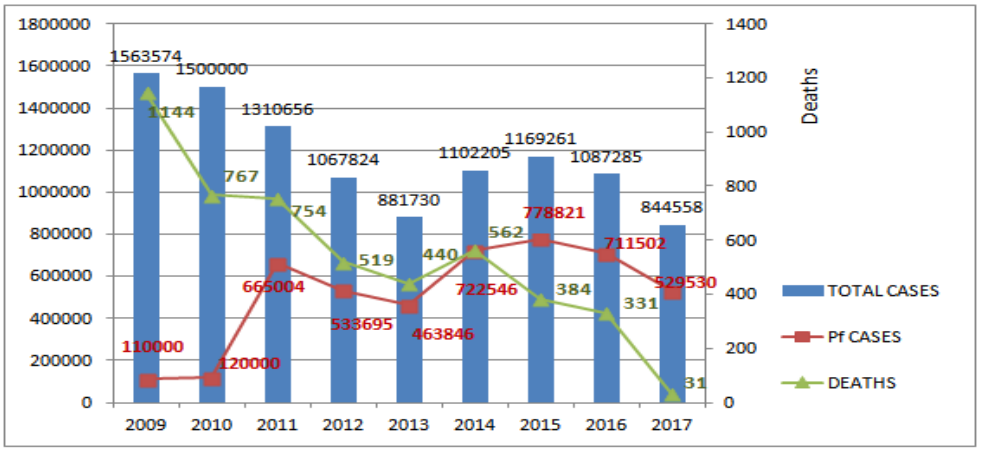
Further statistics reveal that American hospitals account for over $1.3 trillion in economic activity annually (Trend Watch, 2004) while by state, hospitals account for 4.1- 13.3 percent of employment. It is therefore evident that although healthcare costs are a significant burden to all levels of government, the spending represents a substantial economic asset and potential leverage for improving job growth and wages.

DISADVANTAGES

Raising healthcare spending could lead to slow economic growth and employment. Raising healthcare spending has significant impact on federal budget. Many employees are interested in limiting their contribution to increasing healthcare costs by requiring their employees to increase their contributions or by providing different forms of coverage that potentially reduce available household income as more costs are shifted from employer to employee.

The overall economic growth for is 3.6 percent, while healthcare spending is estimated at 9.3 percent. A larger share of resources is therefore allocated on health care, negatively impacting on private and public sectors of economy. Furthermore, federal states and municipal governments are faced with the cost rising more rapidly than revenues, placing high scrutiny on all discretionary healthcare spending.

Companies faced by rising healthcare spending may be forced to cut other expenses, reduce wages, reduce health insurance benefits, or advocate for the employees to pay a greater share of costs. This leads to shifting of more costs to consumers, making them to choose between high value of health care and other goods and services



PUBLIC HEALTH PROGRAMS

Three former directors of the Global Smallpox Eradication Program reading the news that smallpox had been globally eradicated, 1980

The World Health Organization (WHO) identifies core functions of public health programs including:

- providing leadership on matters critical to health and engaging in partnerships where joint action is needed;
- shaping a research agenda and stimulating the generation, translation and dissemination of valuable knowledge;
- setting norms and standards and promoting and monitoring their implementation;
- articulating ethical and evidence-based policy options;
- monitoring the health situation and assessing health trends.

In particular, public health surveillance programs can:

- serve as an early warning system for impending public health emergencies;
- document the impact of an intervention, or track progress towards specified goals; and
- monitor and clarify the epidemiology of health problems, allow priorities to be set, and inform health policy and strategies.
- diagnose, investigate, and monitor health problems and health hazards of the community

12 Common Public Health Issues and How They Can Be Prevented

What's the goal of public health? Quite simply, it's to protect and improve the well-being of individuals and communities. How? By fighting disease and promoting healthy lifestyles. Public health addresses chronic conditions and emergency health threats ranging from heart disease and depression to infectious diseases and violent injuries.

Public health workers are vital to safeguarding a population's health. These individuals investigate, monitor, prevent, and treat health

conditions that impact society. They conduct tasks such as disease research and response, community education and outreach, and injury prevention to meet specific health-related goals.

Public health programs vary in scope. A community-based program might seek to improve diabetes care services in a town experiencing high rates of obesity, while a state or national public health program might focus on a mental health condition disproportionately impacting a certain demographic group.

The need for robust public health programs and trained health professionals becomes evident when considering the scope and scale of these common public health issues:

- Cardiovascular disease
- Type 2 diabetes
- Hypertension
- Schizoaffective disorder
- Clinical depression
- Borderline personality disorders
- Opioid addiction
- CNS depressant abuse
- Prescription stimulant abuse
- Panic disorder
- Social anxiety
- Phobias

Truncal Obesity Issues: The Wide Impact They Have on Health

The prevalence of obesity in the U.S. population is skyrocketing, jumping from about 30% in 2000 to more than 40% in 2018, according to the U.S. Centers for Disease Control and Prevention (CDC). Obesity contributes to numerous health conditions, including heart disease, diabetes, stroke, and cancer.

A community health program looking to lower obesity rates might work to:

- Educate residents about healthy eating
- Improve access to healthy foods
- Facilitate access to affordable healthcare resources

Meanwhile, a state public health agency might investigate rates of obesity among different ethnic groups to discover why cases are higher among certain populations, exploring factors such as income levels, living situations, and crime rates.

Public Health Issue #1: Cardiovascular Disease

Cardiovascular diseases — primarily heart disease and stroke — are the leading global cause of death, according to the World Health Organization (WHO). Common heart diseases include coronary artery disease, arrhythmia, and cerebrovascular disease.

- High blood pressure
- Elevated glucose levels
- Raised lipid levels

- Dangers of eating energy-dense foods with high fat and sugar contents
- Health impacts of physical inactivity
- Cardiovascular risks related to smoking

Public Health Issue #2: Type 2 Diabetes

Diabetes is another top cause of death worldwide. The condition occurs when the pancreas doesn't produce enough insulin (Type 1 diabetes) or when the body cannot process insulin (Type 2 diabetes). diabetes may cause damage to the:

- Heart
- Eyes
- Kidneys
- Nerves
- Blood vessels

Abdominal obesity is connected to a number of metabolic disorders including insulin sensitivity and glucose intolerance, two key factors in the development of diabetes. Obesity can also increase the risk of complications from diabetes such as diabetic neuropathy.

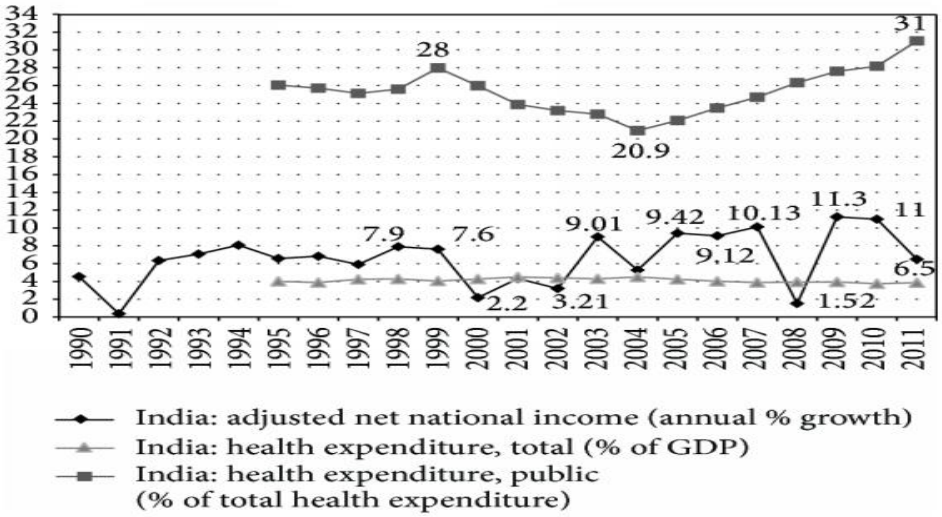
In addition to advising populations on the benefits of consuming nutrient-rich foods and getting regular exercise, public health programs can help reduce instances of diabetes and diabetes-related conditions through regular health screenings. Early diagnosis is key to preventing and treating diabetes.

Public Health Issue #3: Hypertension

Another symptom of obesity is hypertension, or high blood pressure, which is a key contributor to heart disease. Screenings for high blood pressure are part of routine preventive care protocols.

However, some populations don't have proper access to routine medical care or can't afford care services. Millions of adults have uncontrolled hypertension, which can be managed with diet, exercise, and medication.

- Collect research on health trends in communities and demographic groups
- Monitor the outcomes of specific intervention programs to determine which efforts are most effective



SOCIETY APPROACH TO PANDEMIC PREPAREDNESS.

Government leadership

While all sectors of society are involved in pandemic preparedness and response, the national government is the natural leader for overall coordination and communication efforts. In its leadership role, the central government should:

- identify, appoint, and lead the coordinating body for pandemic preparedness and response; enact or modify legislation and policies required to sustain and optimize pandemic preparedness, capacity development, and response efforts across all sectors;
- prioritize and guide the allocation and targeting of resources to achieve the goals as outlined in a country's Pandemic Influenza Preparedness Plan;
- provide additional resources for national pandemic preparedness, capacity development, and response measures; and
- consider providing resources and technical assistance to countries experiencing outbreaks of influenza with pandemic potential.

Health sector

The health sector (including public health and both public and private health-care services), has a natural leadership and advocacy role in pandemic influenza preparedness and response efforts. In cooperation with other sectors and in support of national intersectoral leadership, the health sector must provide leadership and guidance on the actions needed, in addition to raising awareness of the risk and potential health consequences of an influenza pandemic. To fulfil this role, the health sector should be ready to:

- provide reliable information on the risk, severity, and progression of a pandemic

and the effectiveness of interventions used during a pandemic;

- prioritize and continue the provision of health-care during an influenza pandemic;
- enact steps to reduce the spread of influenza in the community and in health-care facilities; and
- protect and support health-care workers during a pandemic.

Non-health sectors

In the absence of early and effective preparedness, societies may experience social and economic disruption, threats to the continuity of essential services, reduced production, distribution difficulties, and shortages of essential commodities. Disruption of organizations may also have an impact on other businesses and services.

For example, if electrical or water services are disrupted the health sector will be unable to maintain normal care. The failure of businesses would add significantly to the eventual economic consequences of a pandemic. In order to minimize the adverse effects of a pandemic, all sectors should:

- establish continuity policies to be implemented during a pandemic;
- plan for the likely impact on businesses, essential services, educational institutions, and other organizations;
- establish pandemic preparedness plans;
- develop capacity and plan for pandemic response;
- plan the allocation of resources to protect employees and customers;
- communicate with and educate employees on how to protect themselves and on measures that will be implemented; and
- contribute to cross-cutting planning and response efforts to support the continued functioning of the society.

Communities, individuals, and families

Civil society organizations, families, individuals, and traditional leaders all have essential roles to play in mitigating the effects of an influenza pandemic. Non-governmental groups should be involved in preparedness efforts and their expertise and capabilities harnessed to help communities prepare for and respond to a pandemic. The supporting document *'Whole-of-society pandemic readiness'* explores the roles of each of these groups in greater detail.

Civil society organizations

Groups that have a close and direct relationship with communities are often well placed to raise awareness, communicate accurate information, counter rumours, provide needed services, and liaise with the government during an emergency.

Individuals and families

During a pandemic, it is important that households take measures to ensure they have access to accurate information, food, water, and medicines. For families, access to reliable information from sources such as WHO and local and national governments will be essential. Individuals, especially those who have recovered from pandemic influenza, may consider volunteering with an organized group to assist others in the community.

WHO

WHO has been mandated by a series of World Health Assembly resolutions to provide Member States with guidance and technical support regarding influenza. These are listed below:

- **WHA 56.19:** Prevention and control of influenza pandemics and annual epidemics;
- **WHA 58.5:** Strengthening pandemic influenza preparedness and response;
- **WHA 60.28:** Pandemic influenza preparedness: sharing of influenza viruses and access to vaccines and other benefits.

WHO will work with Member States across a range of activities, including coordination under the IHR (2005), designation of global pandemic phases, switching to pandemic vaccine production, coordination of a rapid containment operation, and providing early assessments of pandemic severity.

Coordination under International Health Regulations (IHR 2005)

The International Health Regulations (2005) also referred to as IHR (2005),[11] are an international legal instrument adopted by the World Health Assembly in 2005.[12] They are legally binding upon 194 States Parties around the world and provide a global legal framework to prevent, control, or respond to public health risks that may spread between countries.

Under the IHR (2005), a number of reporting requirements obligate States Parties to promptly inform WHO of cases or events involving a range of diseases and public health risks. These include the obligation to notify WHO of all cases of "human influenza caused by a new subtype" in their territories within 24 hours of assessment in accordance with the case definition established by WHO for this specific purpose.

- if the public health impact is serious;
- if the event is unusual or unexpected;
- if there is a significant risk of international spread; or
- if there is a significant risk of international travel or trade restrictions.

The IHR (2005) also obligates States Parties to develop national public health capacities to detect, assess and respond to events, and to report to WHO as necessary If a potential pandemic or related public health risk should arise, the IHR

also provides extensive options for national authorities to obtain information from incoming aircraft, ships, and other vehicles and travellers, and includes the potential use of medical or public health interventions subject to various safeguards and other requirements.

The designation of the global pandemic phase

The designation of the global pandemic phase will be made by the Director-General of WHO. The designation of a phase will be made consistent with applicable provisions of the IHR (2005) and in consultation with other organizations, institutions, and affected Member States.

Switching to pandemic vaccine production

WHO issues bi-annual recommendations on the composition of seasonal influenza vaccines and, in addition, has been reviewing vaccine candidate viruses for A (H5N1) and other influenza subtypes with pandemic potential since 2004.

This process is undertaken in consultation with WHO Collaborating Centres (CCs) for influenza, National Influenza Centres, WHO H5 Reference Laboratories, and key national regulatory reference laboratories based on surveillance conducted by the WHO Global Influenza Surveillance Network (*GISN*).

Rapid containment of the initial emergence of pandemic influenza

The intention of a pandemic influenza rapid containment operation is for national authorities, with the assistance of WHO and international partners to prevent or delay the widespread transmission of an influenza virus with pandemic potential as soon as possible following its initial detection. Rapid pandemic containment is an extraordinary public health action, which builds upon, but goes beyond, routine outbreak response and disease control measures.

The WHO pandemic rapid containment guidance,[20] which is periodically reviewed and updated, outlines what should be done, provides information on how to do it, and serves as the foundation for the development of more detailed operational plans. Rapid containment poses a number of planning, resource, and organizational challenges. The exercising of operational components of pandemic preparedness and response plans, including elements related to pandemic rapid containment operations is strongly encouraged.

Providing an early assessment of pandemic severity on health

As soon as possible, WHO will provide an assessment of pandemic severity to help governments determine the level of interventions required as part of their response. As outlined in section 2, past influenza pandemics have been associated with varying levels of illness and death. Although making an informed assessment of severity early in the course of a pandemic will be challenging, such an assessment will assist countries in:

- deciding whether or not to implement mitigation measures that may be potentially disruptive;

- prioritizing the use of antivirals, vaccines, and other medical interventions;
- managing continuity of health care; and
- communicating with the media and the public and answering queries.

Pandemic severity may be assessed in many ways. One fundamental distinction is an assessment based on direct health effects as opposed to one based upon societal and economic effects. While societal and economic effects may be highly variable from country to country and dependent upon multiple factors (including the effects of the media and the underlying state of preparedness), WHO plans to assess pandemic severity based primarily on observable effects on health.[21]

Essential components of an effective pandemic influenza surveillance system will include:

- early detection and investigation;
- comprehensive assessment; and
- monitoring.

CONCLUSION

we **need a healthy lifestyle to build up a healthy immune system and to avoid disease**. Here, "maintain" means a healthy immune system to protect your body. To maintain body immunity, We should eat a variety of food and keep a balanced diet.

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Biofilms Formation and its various effects in the Field of Biotechnology

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ABSTRACT

Biofilms are manifested in nature and the complex surface (bacterial, algal and fungal)require attachment areas which are termed as an Extracellular matrix(ECP) which is made of lipids, proteins, nucleic acids, and polysaccharides etc. The nature of microbes may vary in different habitat and environment. As we know that biofilms are found in planktonic or sessile surfaces, on the basis of that it categories in five phases; Cell attachment, Cell to cell adhesion, Cell proliferation and growth, Cell maturation and Cell detachment and dispersal. The role of Extracellular polymeric substances (EPS) is to immobilize biofilm cells, maintained long-term proximity and allows intense interactions to occur, including; horizontal gene transfer, cell-cell communication and also the formation of synergistic microbial interaction. It was demonstrated that micro-structural and mechanical properties of biofilms can be developed via colloidal self-assembly cells and polymers.

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INTRODUCTION

Biofilms

A bacterial cell generally occurs in two different types of growth planktonic cells and Sessile aggregates. The sessile aggregates are termed as Biofilms. Biofilms are ubiquitous in nature. It is attached to aquatic sediments and contaminated soils where it releases some chemicals into the environment. Microorganism living in Biofilm form is more beneficial for cell growth and survival in the protected environment. These adherent cells become attached with extracellular matrix that is made up extracellular polymeric substances (EPS). Overall 90% of all bacteria live in biofilms. The cells within the biofilm produce

the EPS components are polysaccharides, lipids, proteins, and DNA. Biofilms can adhere to a surface like a tooth, rocks, and sewage pipelines surface and food products etc. The smallest unit of biofilm is Micro colony. (Toole et al., 2000).
Presence of biofilms in different habitats and its application

Biofilms formation is rapidly increased day by day by in medical, food and other industrial systems. It may be caused by both disease-causing and non-disease-causing microbes (Deibel et al., 2003) .Some of them is discussed below:-

Biomedical Devices and Clinical settings: Biofilms are commonly found in the biomedical devices and implants within the human body. These organisms typically originate from the skin of a patient or health care worker, or tap water to which the device is exposed Such medical devices include urinary catheters, central venous catheters, prosthetic heart valves and artificial hip prosthesis. Biofilm formation involves in adhesion of fungal cells to retreated substrates and formed growth in the medium (Chandra et al.,2008).Microbes in Biofilms gain access to the catheter by migrating externally from the skin along the exterior catheter surface or internally from the catheter port. It has been observed that colonization and biofilm formation can occur within 3 days of inserting the catheter, but biofilm formation on internal surfaces of the catheters is more likely to be present for those that remain in place for longer periods of time. Specific to urinary catheters, biofilms that develop will infect the patient and result in a urinary tract infection. This is more likely to happen in an open system, where the catheter drains into an open collection center than a closed system, where the catheter empties into a plastic bag. Time is also a variable; essentially all patients who have a urinary catheter for more than 30 days get infected with a UTI (Kokare et al., 2009). A study demonstrated that bacterial pathogens in biofilms play a role in chronic rhinosinusitis (CRS). Biofilms in mucosal specimens of patients undergoing surgery for CRS. The total number of 30 samples and 4 control samples were studied. By using scanning electron microscopy (SEM) 24 (80%) of the 30 patients were found to have micrographic evidence of Biofilms.The six cryofixation samples showed biofilm structures on SEM micrographs that were correlated with bacterial structures seen at the mucosal surface.Bacterial cultures were positive on all patients was visualized.The biofilm 3-D structure, glycocalyx, and water channels were seen in TEM (transmission electron microscope) cleared that bacteria present in the biofilm. (Sanclement et al , 2009).Artificial mature biofilm of K. Pneumonia B5055 was made on polycarbonate membranes. The center of biofilm had more inactive cells whereas periphery had more actively dividing cells. Amikacin antibiotic (40 μg ml−1) susceptibility was determined and it was found that cells in younger biofilm were more susceptible as compared to cells in the older biofilm. The thickness and heterogeneity of biofilm increased from 0.093 to 0.231mm with time and the effectiveness of antibiotic decreases (Singhla et al, 2014).In another study biofilm formation by 115 clinical uropathogenic E.coli strains under different growth, conditions were

studied using spectrophotometer (A531) after (crystal violet) staining and correlated with bacterial growth (A600). The live and dead cells in biofilm formation were observed on the glass surface by an epifluorescence microscope. It was concluded that biofilm was maximum in the rich medium after 24 h and its level has not changed in time. When biofilm level was compared to bacterial growth it shows that in the minimal medium growth was higher. The results suggested that bacteria prefer to grow in the biofilm community (Bialek et al., 2015). It is a known fact that biofilms that occur on dry surfaces have increased tolerance to disinfectants. A study was conducted in which formulated and non formulated disinfectants were tested against Staphylococcus aureus species grown in the form of dry surface biofilms (DSB) in the bioreactor with alternate hydration and dehydration cycles. The efficacy of treatment was detected both in the presence or absence of organic soil. Biofilms were treated with disinfectants like peracetic acid, hydrogen peroxide, and chlorine and the residual biofilm viability and mass were calculated by plate culture and protein assay respectively. The results were obtained showed that the chlorine-based products reduced the viability of biofilms by 2.8log10, and 2log10 for proxitane but products failed to reduced biofilms in the soil. Surfex disinfectant completely inactivated biofilm (6.3log10). Hydrogen peroxide products showed minimal efficacy against dry surface biofilm. So it may be concluded that formulated disinfectants with active ingredients increase biofilms degradation (Chowdhury et al., 2018).

Biofilms in the Oral Cavity: In saliva, Salivary micelle-like globules (SMGs) present in enamel determines the adhesive interactions that cause a specific organism to adhere to the pellicle. Dental biofilm occurs primarily as microcolonies. The acquired pellicle attracts gram-positive cocci such as Str. mutans and Streptococcus sanguis, organisms in plaque formation. Subsequently, a filamentous bacterium such as Fusobacterium nucleatum and slender rods adhere to primary colonizers. Vibrios and spirochetes appear as the biofilm thickens. Calcified dental biofilm is termed as calculus. The precipitation of calcium phosphates within the organic plaque matrix, which depends on plaque, pH, and phosphate, local saturation of calcium and availability of fluoride ions and biological factors such as crystallization nucleators/inhibitors from either bacteria or oral fluids. (Listgarten,1999).A study was conducted on oral pathogens like Streptococcus mutans which are retained on toothbrushes and form biofilms which may infect users. The professional dentist rejects the use of toothbrushes covers from e external contaminant from minimizing exposure to air. This study suggested that increasing the ventilation of tooth brushes covers will reduce the retention of S.mutans. There were 12 samples of brushes there out of which 4 modified toothbrushes covered, 4 unmodified toothbrushes and 4 uncoverd.Toothbrushes were incubated in Brain heart infusion (BHI) broth at 37degree Celsius for 48 hours stained with crystal violet and colonies counted under a stereoscopic microscope. The study concluded that as ventilation is increased .There is retention of biofilms which would result in a safe dental product. (King, 2004).The

antibiotic resistance and biofilm formation interested among a collection of 51 clinical isolates of Staphylococcus pseudointermedius collected from canine pyoderma. All isolates were tested for the susceptibility of 14 antimicrobial agents by the disk diffusion method in Mueller-Hinton agar. Oxacillin resistance was detected by subculture on oxacillin screening agar base. Biofilm formation was investigated by the Microtitre Plate test (MtP) and for some strains by transmission electron microscopy (TEM). Antibiotic resistance profiling demonstrated that 45/51 Staphylococcus pseudointermedius isolates had a multi drug resistant (MDR) phenotype, exhibiting simultaneous resistance to at least 3 antibiotics categories; whereas 6 isolates showed a non-MDR phenotype. Thirty strains (59%) were resistant in oxacillin resistant screening agar, the same strains were also positive for mecA by PCR assay. All Staphylococcus pseudointermedius isolates showed biofilm production by MtP method. Seventeen out of 51 isolates were classified as weakly adherent, 26 as moderately adherent, and 8 as strongly adherent. Moreover, no difference in biofilm formation between methicillin-resistant Staphylococcus pseudointermedius (MRSP) and methicillin-susceptible Staphylococcus pseudointermedius (MSSP) (P value > 0.05) was noted. The antimicrobial resistance mechanisms and biofilm formation could explain the difficulty in treating Staphylococcus pseudointermedius canine infections, chemotherapeutic failure, and consequently persistent infections. (Stefanetti et al., 2017).

Water Systems: -Biofilms occurs in water distribution systems can protect pathogenic (disease-causing) microbes from disinfection and they can also a threat to public health. When microorganisms enter the inner surfaces of drinking water treatment systems, storage containers, and downstream distribution plumbing, the biofilms become a potential source of microbial (i.e. regrowth) contamination of water. Public health problems associated with biofilms included a microorganism in Flint's drinking i.e. Legionella.A study was determined that the kinetic ability of two strains serotypes L.pneumophila serotype1 and serotype 2-15 to adhere and form biofilm on three different surfaces like stainless 70ptimizes70, copper and polyethylene commonly distributed in hot water system at Morocco at three different temperatures ie.20°,37°,44°C L.pneumophila serogroup 2-15 revealed high capability to adhere and form biofilm on stainless 70ptimizes70 surface and polyethylene serotype 1rather than copper at 37° then 20° then 44° C.(Tai et al al,2012).Filamentous fungi have been constantly recovered from diverse aquatic environments including drinking water distribution systems. Although most of the works are focused on the study of planktonic form, recent researches have shown that fungi develop biofilm within these systems. In a study, Aspergillus sp. (section Nigri), Aspergillus sp. (section Flavi), Alternaria sp., Botrytis sp., Cladosporium sp., and Penicillium sp. Recovered from water biofilms and capability to grow as biofilms under laboratory conditions was evaluated. All six isolates were able to form a biofilm, though different patterns of development were reported.

Only Alternaria sp. Formed biofilm in water over 24 h of analysis. Malt extract broth (MEB) was shown to be the best culture media for biofilm formation. A direct correlation between biomass and cell activity was not observed, but biomass values and EPS production were directly correlated. (Virgina and Lima, 2013).

Biofilms and food industry:-Biofilms in the food industry are of importance because they have the potential to persist in food sources or from transmission of diseases. Poor sanitation conditions, food contact part, processing environment, and equipment etc have an essential factor in foodborne diseases and microorganisms involving are Salmonella and Listeria monocytogens. Improperly unhygienic surfaces enhance and the presence of moist content will contribute to producing the pathogenic microorganisms (Peterman et al., 1997). The formation of biofilms in food substances is very complex processes. Biofilms formed by Pseudomonas aeruginosa and Staphylococcus aureus were observed to be in the pathophysiology of chronic rhinosinusitis (CRS) .In vitro effect of honey against biofilms produced by Pseudomonas aeruginosa and Staphylococcus aureus .To assess antibacterial activity of honey against 11 methicillin-susceptible and resistant Staphylococcus aureus and 11 Pseudomonas aeruginosa isolates. Honey was tested against both planktonic and biofilm-grown bacteria. It was found to be effective in killing 100 percent of the isolates in the planktonic form. The bactericidal rates for the Sidr and Manuka honeys against MSSA, MRSA, and Pseudomonas aeruginosa biofilms were 63-82 percent, 73-63 percent, and 91-91 percent, respectively. These rates were significantly higher ($P < 0.001$) than those seen with single antibiotics commonly used against Staphylococcus aureus .Honey, which is a natural, nontoxic and inexpensive product, is effective in killing Staphylococcus aureus and Pseudomonas aeruginosa bacterial biofilms. This observation may have important clinical implications and could lead to a new approach for treating refractory chronic rhinosinusitis. (Alandejani et al., 2009). In this study was to assesses through a fractional experimental design and environmental factors that could affect the survival of L.monocytogenes cells on the surface prevent the persistence of this pathogen while on culture with salmon juice or meat exudate medium used with different hygiene status .Biofilm of L.monocytogenes pure culture or dual culture with a Pseudomonas fluoroscens strain application to drying cleaning and disinfection and comparison of L.monocytogenes.Bacterial survival was assessed by culture, qPCR to quantify total cells, and propidium monoazide coupled with qPCR to quantify viable cells and highlight viable but non-culturable (VBNC) cells. Our results showed that 71ptimiz to apply cleaning and disinfection cause cell persistence on surfaces. Moreover, the sanitation procedure leads only to a loss of culturability and appearance of VBNC populations. However, an additional daily drying step after cleaning and disinfection 71ptimizes the effectiveness of these procedures to reduce culturable population. (Overney, et al., 2017).

CONCLUSION

Biofilms are manifested in nature and the complex surface (bacterial, algal and fungal)require attachment areas which are termed as an Extracellular matrix(ECP) which is made of lipids, proteins, nucleic acids, and polysaccharides etc. The nature of microbes may vary in different habitat and environment.The biofilms play a crucial role in medical implantation, industrial wastes, dental caries, and food industries etc. The various novel research strategies are being explored further day by day of formation or eradication of biofilms.

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FDI in Health Sector during COVID-19 in India: A Regression Analysis

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ABSTRACT

One of the most notable features of economic globalization has been the increased importance of Foreign Direct Investment around the World. FDI has the potential to generate employment, raise productivity, enhancing competitiveness of the domestic economy through transfer of skills and technology, enhance exports and contribute to the long-term economic development of the nations. FDI in health care sector has gathered momentum in the recent years. Since January 2000, FDI is permitted up to 100 per cent under the automatic route in hospitals in India. FDI is allowed across the industries and sectors, has proven that foreign investors have faith in the resilience of Indian markets. FDI and GDP are positively correlated with each other and the country's GDP is showing a positive movement with flow of Foreign Direct Investment in India. The flow of FII and FDI also shows the positive correlation with each other.

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INTRODUCTION

The trend in India's Foreign Direct Investment, after the economic reforms, was assessed to analyze the impact of IFDI on the economic growth of the country in terms of GDP. Foreign direct investment has been an important element of India's economic development process. Economic reforms taken by the Indian government in 1991 makes the country one of the prominent performers of global economies by placing the country as the 4th largest and the 2nd fastest growing economy in the world. India also ranks as the 11th largest economy in terms of

industrial output and has the 3rd largest pool of scientific and technical manpower. Continued economic liberalization since 1991 and its overall direction remained the same over the years irrespective of the ruling party moved the economy towards a market–based system from a closed economy characterized by extensive regulation, protectionism, public ownership which leads to pervasive corruption and slow growth from the 1950s until 1990s.

Foreign investors play significant role in the development of the hospital sector. In recent years, there is growing interest among foreign players to enter India‟s health care sector through capital investments, technology tie –ups, and collaborative ventures across various segments including diagnostics, medical equipment, hospitals, education and training. India‟s foreign investment policy is liberal for hospitals. Since January 2000, FDI is permitted up to 100% under the automatic route for the hospitals sector in India. Approval from the Foreign Investment Promotion Board (FIPB) is required only for foreign investors with prior technical collaboration, but allowed up to 100%. This is evident from the fact that private equity funds have invested over $2 billion in health care and life sciences sector over the past five years. Further, India has received USD 1, 32,837 million as aggregate FDI from April, 2011 and specifically hospital and diagnostic centres have received FDI of USD 1030.05 million from April 2000 up to April 2011 constituting 0.78 % of the total FDI in to India. In order to understand the extent and nature of Foreign Direct Investment in hospitals, a list of all FDI approved projects in hospitals and diagnostic centres during the January 2000 to July 2006 periods was obtained from the

Department of Industrial Policy and Promotion. This list consisted of 90 projects, for a total approved FDI amount of $53 million, and covering a wide range of countries, such as Australia, Canada, UK, US, UAE, Malaysia, Singapore etc.

COUNTRY-WISE CONTRIBUTIONS OF FDI INFLOWS IN INDIA

The country-wise inflows in FDI in India have been shown in the table-3.1 covering the period between 2007 and 2017. However, for most countries, the FDI inflows have increased over time.

In the year 2017, Mauritius contributed maximum FDI inflows in India followed by Singapore whereas the minimum FDI inflows in India were from Luxembourg. However, throughout the analysis, the main contributors of FDI inflows were Mauritius, Singapore, USA, Japan, Netherlands & UK. However, the inflows fell in percentage for Mauritius over the period. Mauritius and Germany accounted for a negative percentage change in FDI inflows in India. 2011 is the year of maximum FDI inflows in India. Again, Mauritius is the biggest contributor to it followed by Singapore. The total FDI inflows also increased at a rate of 20% throughout the period. India experienced the highest percentage change in FDI inflows from Spain. Inflows from the USA experienced the

lowest percentage change among all the countries.

In the pie chart that is figure-1, it has been depicted that the percentage of total FDI comes from Mauritius is the highest among all those countries is 25% followed by the countries like Singapore, USA 7% and 2 % respectively, which is so significant for India.

The total FDI inflow in India from 2000 to June-2018 is US$ 545,463 and the total investment by FII is US$ 216,475 million. The FDI in India has shown good growth after 2004 which is depicted in table-2.

Karl Pearson's coefficient correlation for total FDI in India and Investment by FIIs in India for the period 2001 to 2018 for the data given in table 3.3 is 0.40. This analysis is showing that the two variables have a weak positive correlation between them. But it is quite evident from the data that an increase in FDI in India is leading to an increase in investments by FII because of its positive effect on the economic development of a country.

In figure-2, the trend analysis of the FDI data from 2001 to 2018 shows that there is always a positive average trend of FDI in India but FDI flow in India has increased in recent years only starting from 2013 to 2018. The Indian economy has started attracting a good amount of FDI after 2013. Before 2013 the FDI flow was fluctuating, which was just a stagnant trend for FDI. From the above data, we can analyze that during the period of the current global financial crisis, there was a significant decrease in the flow of FDI in most of the countries in 2008-2010 but this decline of FDI in India was relatively moderate reflecting robust equity flows on the back of a strong rebound in domestic growth ahead of Global recovery and steady reinvested earnings reflecting better profitability of foreign companies in India.

SECTOR-WISE ALLOCATION OF FDI INFLOW

The Sector-wise allocation of FDI inflow shows a clear picture of the direction of FDI in India. Among the various sectors, the service sector is attracting maximum funds of 18% of total FDI amounting to 189,991 crores followed by construction and development with an 11% share amounting to Rs. 110,234 crore.

In table-4, the other sectors like Computer Software & Hardware, telecommunication, construction, automobile industry and trading are also attracting a good share of FDI in India. As for as the service sector is concerned according to the Economic Survey of India, India has the second-fastest-growing services sector in the world with a compound annual growth rate at 9 per cent, just below China's 10.9 per cent, from 2001 to 2012. Among the world's top 15 countries in terms of GDP, India ranked 10th in terms of overall GDP and 12th in terms of services GDP in 2012. Thus, this reason can be attributable to the highest share of FDI to the Service sector as India has the second-fastest-growing services sector with a CAGR at 9 per cent, just below China's 10.9 per cent, during the last 11-year period from 2001 to2012. They believe India will

be increasingly recognized as a favoured FDI destination if growth is accompanied by continued structural reforms," UBS said in a research note. This is a great leap forward.

Summary statistics of FDI in different sectors which are in table-5 depicts that the average FDI is Rs.135081 crores and the standard deviation is Rs.87323 Crores. It implies that there is a high disparity among the sectors in FDI inflow.

Figure-3 displays FDI in different sectors in India and it is visible in the figure that in the services sector, the allocation of FDI is highest than the other sectors and it is followed by computer software and hardware.

INFLOW OF FOREIGN DIRECT INVESTMENT AND GROSS DOMESTIC PRODUCT (GDP)

Foreign Direct Investment and Gross domestic product are the major determinants of the economy of any country. FDI affects the GDP of a country directly and hence they are positively correlated. But the FDI in a country is not the only economic factor on which causes the GDP to increase or decrease there are so many quantitative and qualitative economic and non-economic variables that influence the GDP of a country. Gross Domestic Product refers to the market value of all final goods and services produced within a country in a given period. It is often considered an indicator of growth and standard of living for a country. Foreign Direct Investment has a close relationship with Gross Domestic Product (GDP) in India. The year-wise FDI inflows along with GDPs secured by India are seen in Table-3.6.

Table-6 exhibits the FDI inflows and the Gross Domestic Product (GDP) achieved by the country. The FDI inflows have increased from US $ 34298.01 million in 2013 to the US $ 60974.29 million in 2018. During the study period, the percentage of growth over the previous year lies between 6.39% and 6.62% in 2017. During the study period, the percentage of growth over the previous year lies between 6.4 % and 7.5 %. The highest growth rate has been observed (10.3%) in 2010 and the lowest growth rate has been observed (1.1%) in the year 1991

CAUSALITY BETWEEN FDI INFLOW AND GROSS DOMESTIC PRODUCT (GDP)

Foreign Direct Investment and Gross domestic product are the major determinants of the economy of any country. FDI affects the GDP of a country directly and hence they are positively correlated. But the FDI in a country is not the only economic factor on which causes the GDP to increase or decrease there are so many quantitative and qualitative economic and non-economic variables that influence the GDP of a country. Gross Domestic Product refers to the market value of all final goods and services produced within a country in a given time. It is often considered an indicator of growth and standard of living for a country. Foreign Direct Investment has a close relationship with Gross Domestic Product (GDP) in India.

Correlation analysis was carried out to find out the relationship between the variables Foreign Direct Investment and Gross Domestic Product.

Table-7 exhibits the relationship between Foreign Direct Investment and Gross Domestic Product of India from 2000 to 2018. The correlation coefficient is 0.88 which is significant at 0.01 levels. It indicates that there is a strong positive relation between FDI inflows and GDP.

GRANGER CAUSALITY

The causal nexus between FDI and economic growth, in India, is analysed using the Granger causality test (Grangers 1969). Granger causality test assumes that data series are stationary. To verify the stationary properties of FDI and GDP, the standard unit roots test is like the augmented Dickey-Fuller (ADF) test. Annual data for FDI and GDP (a proxy for economic growth) from 1991 to 2018 is used to check the causality. The necessary data were collected from the Reserve Bank of India and DIPP.

Table- reveals ADF test results for FDI and GDP in India. The results reveal that the ADF test accepts the null hypothesis of a unit root in its level. When the ADF statistics are extended to the first differenced variables, it can be observed that the null hypothesis is rejected for FDI and is accepted for GDP (for few countries, while for few other countries the variables are stationary at first difference itself). Hence the ADF statistics is further extended to second differenced variables. It is observed that the null hypothesis is rejected for GDP. Hence, the selected variables, FDI and GDP are stationary at the second difference.

The Granger (1969) test for causality between two variables is employed for this study. The test indicates that, for two time-series variables X_t, and Y_t, if X improves the prediction of Y, then X (Granger) causes Y. The estimating equations can be written simply as follows.

$$\mathbf{GDP_t} = \sum \boldsymbol{\alpha 1 i GDP} \mathbf{t} - \mathbf{i} + \sum \boldsymbol{\beta 1 i FDI t - i} + \sum \boldsymbol{\alpha 2 i FER t - i} + \sum \boldsymbol{\beta 2 INF t - i} + + \boldsymbol{ut}$$

Where GDP and FDI_t are stationary time series, u_t and v_t are white noise error terms and *i* and *j* are the maximum lag length used in each time series.

DISCUSSIONS

The Flow of FDI in India is showing a positive trend and is a very positive signal for the Indian Economy. The Indian Economy is one of the most favourable investment destinations for most of the developed and developing countries. The Inflow of FDI and FII in India has positive relationship between each other. The FDI is significantly contributing to the economic development of India as it has a positive correlation coefficient of 0.6 with Indian GDP.

The service sector of India is the second-fastest-growing services sector with a CAGR at 9 per cent, just below China's 10.9 per cent, during the last 11-year period from 2001 to 2012 and that Is why the Indian service sector shares the maximum share of the total FDI In India.

The FDI trend in the Indian Economy is moving in an upward direction that too with the good speed. Based on the above analysis it is quite evident to say that the Indian economy is one of the most promising investment destination for most of the developed and developing nations. And we should grab this opportunity by liberalising the rule and regulations for FDI in India. But one question that is striking my mind is that despite having a good inflow of FDI in India just after the recession period. Why we are not able to attract more FDI. As the growth rate of FDI in India for the period of 2010 to 2014 is not much attractive. So we need to find some factors that are causing the slowdown of FDI inflow in the Indian Economy.

DECLARATIONS

I, hereby, declare that the current research paper has neither been funded by any government or non-government organization nor been published earlier in any journal or book.

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APPENDICES

Table-1 Country-Wise Contributions of FDI Inflows in India (In US million dollars)

Countries	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mauritius	9518	1016	9801	5616	8142	8,059	3,695	5,878	7,452	13,38	13,41
Singapore	2827	3360	2218	1540	3306	1,605	4,415	5,137	12,47	6,529	9,273
USA	950	1236	2212	1071	994	478	617	1,981	4,124	2,138	1,973
Cyprus	570	1211	1623	571	1568	415	546	737	488	282	290
Japan	457	266	971	1256	2089	1,340	1,795	2,019	1,818	4,237	1,313
Netherland	601	682	804	1417	1289	1,700	1,157	2,154	2,330	3,234	2,677
UK	508	690	643	538	2760	1,022	111	1,891	842	1,301	716
Germany	486	611	602	163	368	467	650	942	927	845	1,095
UAE	226	234	373	188	346	173	239	327	961	645	408
France	136	437	283	486	589	547	229	347	392	487	403
Switzerlan	192	135	96	133	211	268	356	292	195	502	506
Spain	48	363	125	183	251	348	181	401	141	213	NA
South	86	95	159	136	226	224	189	138	241	466	293
Other	2699	3034	2374	1184	989	1,394	1,501	1,754	2,677	1,109	1,889
Total	1930	2251	2228	1448	2312	18,04	15,68	23,99	35,06	35,37	3425

Source- RBI database

2. TREND AND GROWTH OF FDI INFLOW AND INVESTMENT BY FII IN INDIA

Table-2 FDI inflow and Investment by FII in India

Year	Total FDI (US $ Million)	%age growth over the previous year (in US$ terms)	Investment by FII (US $ Million)
2000-01	4029	------	1847
2001-02	6130	52%	1505
2002-03	5035	(-)18%	377
2003-04	4322	(-)14%	10918
2004-05	6051	40%	8686
2005-06	8961	48%	9926
2006-07	22826	155%	3225
2007-08	34843	53%	20328
2008-09	41873	20%	(-)15017
2009-10	37745	(-)10%	29048
2010-11	34847	(-)8%	29422
2011-12	46556	34%	16812
2012-13	34298	(-)26%	27582
2013-14	36046	5%	5009
2014-15	45148	25%	40923
2015-16	55559	23%	(-)4016
2016-17	60220	8%	7735
2017-18	60974	3%	22165
Total	545,463	-	216,475

Source: Department of industrial policy and Promotion (Govt. of India)

Table-3 Correlation Matrix

	Total FDI (US $ Million)	Investment by FII (US $ Million)
Total FDI (US $ Million	1	
Investment by FII (US $ Million)	0.40	1

Source-Computed by author

Table-4 Sectors Attracting Highest FDI in India (Amount in Crore)

S.No	Sector	2000-2018	Percentage (%)
1	Services Sector	359,816.79	17.56
2	Computer Software & Hardware	176,458.83	8.18
3	Telecommunications	169,912.07	8.00
4	Construction Development: Townships, Housing, Built-Up Infrastructure and Construction-Development Projects	118,110.67	6.59
5	Automobile Industry	105,679.21	4.98
6	Trading	112,635.36	4.92
7	Drugs & Pharmaceuticals	82,322.34	4.17
8	Chemicals (Other Than Fertilizers)	77,377.30	3.87
9	Power	70,559.48	3.51
10	Construction (Infrastructure) Activities	77,945.83	3.33

Source: Department of industrial policy and Promotion (Govt. of India)

Table-5 Summary Statistics

	FDI	**FII**
Mean	135081.8	6.51
Standard Error	27614.09	1.35
Median	109157.3	4.95
Standard Deviation	87323.42	4.26
Kurtosis	5.43	5.70
Skewness	2.22	2.26
Range	289257.3	14.23
Minimum	70559.48	3.33
Maximum	359816.8	17.56

Source-Computed by author

Table-6 Year-wise Inflow of FDI and GDP (Inflation under 5%)

year	FDI in the US $ Million	GDP at MP US $ Billion	GDP growth rate	year	FDI in the US $ Million	GDP at MP	GDP growth rate
1991	97.00	1.06	1.1 %	2005	6051.00	9.28	9.3 %
1992	129.00	5.48	5.5 %	2006	9697.00	9.26	9.3 %
1993	315.00	4.75	4.8 %	2007	22826.00	9.80	9.8 %
1994	586.00	6.66	6.7 %	2008	34843.00	3.89	3.9 %
1995	1314.00	7.57	7.6 %	2009	41873.00	8.48	8.5 %
1996	2144.00	7.55	7.6 %	2010	37745.00	10.26	10.3 %
1997	2821.00	4.05	4.1 %	2011	34847.00	6.64	6.6 %
1998	3557.00	6.18	6.2 %	2012	46553.00	5.46	5.5 %
1999	2462.00	8.85	8.5 %	2013	34298.01	6.39	6.4 %
2000	2155.00	3.84	4.0 %	2014	36046.49	7.41	7.4 %
2001	4029.00	4.82	4.9 %	2015	45147.95	8.15	8.2 %
2002	4095.00	3.80	3.9 %	2016	55558.55	7.11	7.1 %
2003	2764.00	7.86	7.9 %	2017	60220.28	6.62	6.7 %
2004	2229.00	7.92	7.8 %	2018	60974.29	11.7	7.5 %
				total	555377.56	179.17	

Source: DIPP (GOI) and Reserve Bank of India.

Table-7 Correlations between FDI and GDP

		FDI	GDP
FDI	Pearson Correlation	1	0.88**
	Sig. (2-tailed)		.01
	N	16	16
GDP	Pearson Correlation	0.88**	1
	Sig. (2-tailed)	.01	
	N	16	16

Source – computed by the author.
****. Correlation is significant at the 0.01 level (2-tailed).**

Source-Computed by author

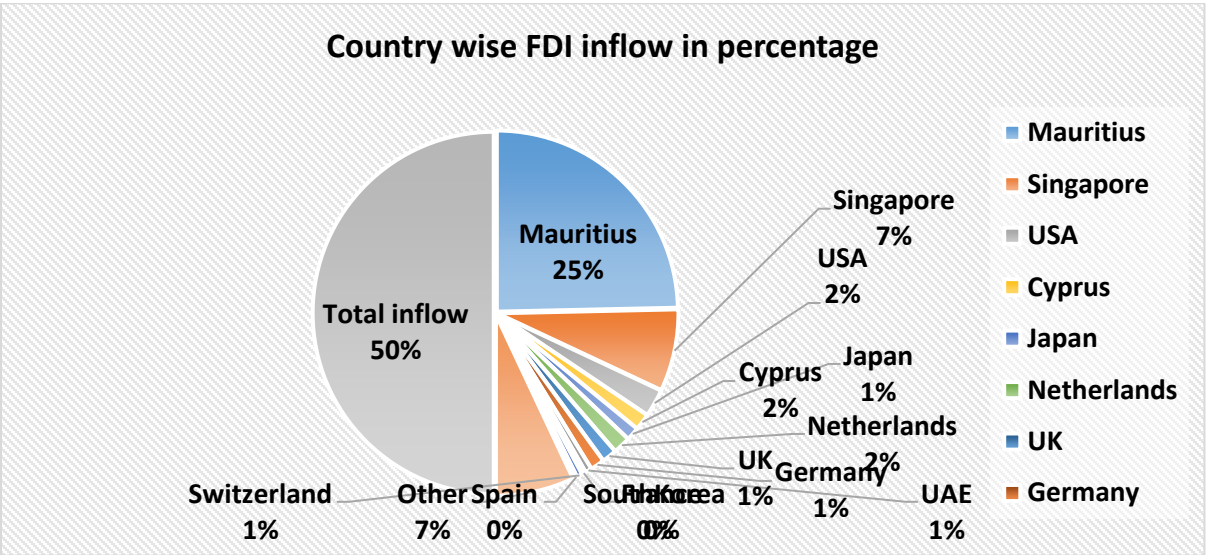
Table-8 Augmented Dickey-Fuller Test Results

	At logarithmic levels		First Difference		Second Difference	
	FDI	GDP	FDI	GDP	FDI	GDP
With Intercept	-0.96 (0.74)	0.71 (0.97)	-3.70 (0.01) *	-2.70 (0.08) **	-5.61 (0.00) *	-5.76 (0.00)
With Intercept & Time Trend	-2.01 (0.55)	-2.76 (0.23)	-3.68 (0.06)	-2.62 (0.25)	-5.48 (0.00) *	-5.59 (0.00) *
Without Intercept and Time Trend	1.33 (0.95)	5.06 (1.0)	-3.57 (0.00) *	-0.13 (0.62)	-5.94 (0.00) *	-5.98 (0.00) *

Source – computed by the author.

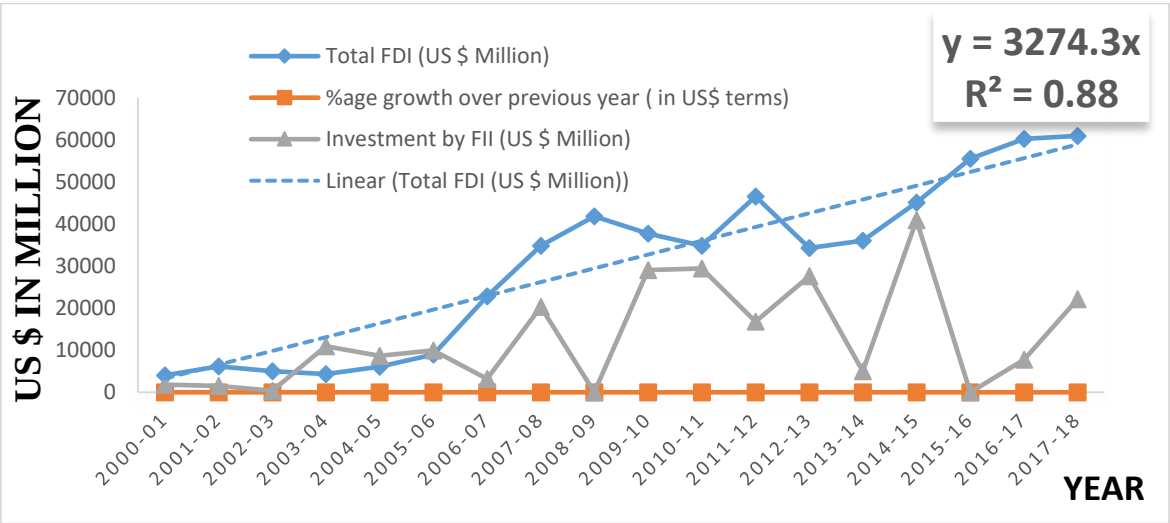
FIGURES

Figure-1 Country-Wise Contributions of FDI Inflows in India (In US million dollars)



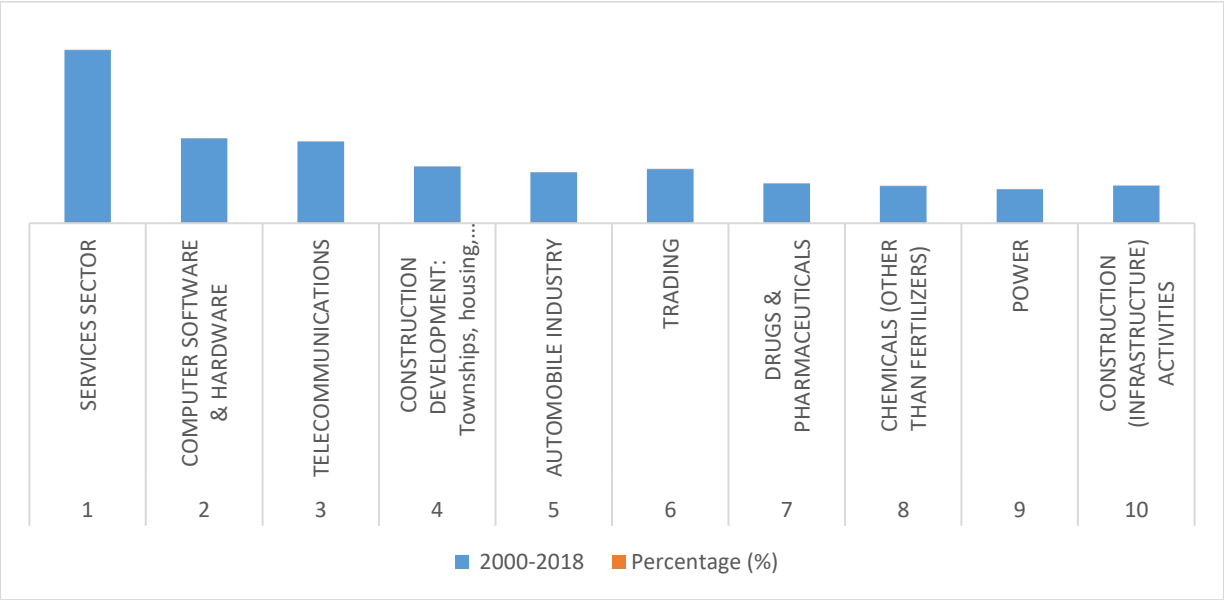
Source-Computed by author

Figure-2 Trend of Total FDI (US $ Million)



Source-Computed by author

Figure-3 FDI inflow to sectors (2000-2018)



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Enlightening the Future on the Nutrional Values of Edible Insects to Man's Health and as an alternative Source of Food

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ABSTRACT

Edible insects are important natural protein resource that can contribute to resilient food security. Edible insects not only play an important role in traditional diets, but are also an excellent source of protein in traditional dishes in the world nowadays. Therefore the principal aim of this paper is to portray and enlighten the future on the nutrional values of edible insects to man's health and as an alternative source of food considering the low economic situation that the world has found itself. Edible insects could be use due to their high excellent nutrional content, potential socio-economic benefits. The method adopted for this research is using content analysis. During which different search strategies were used to access published articles to review literatures of some other authors in the field of applied entomology in order to trace significant value of edible insects as an alternative source of food to man and their values to his health as well. The search terms includes but not only limited to the following: what are edible insects, Are the edible insects valuable to man at all, do the edible insects contribute to bio economic growth etc. Lastly References in the identified articles were used, reviewed to draw conclusion that the edible insects have nutrional values to man's health and also can serve as an additional alternative source of food to him and could be use for an economic growth as well. The results of this study confirm the fact that insects are indeed a good source of protein and other nutrients. Therefore consumption of non-toxic insects, should be encouraged, as they serve as an alternative nutrition source in human diets like protein supplements, have much nutrients to offer and economic growth as well.

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INTRODUCTION

Insects are a class of animals within the arthropod phylum. The total number of insect species on Earth is estimated to be 2-3 million and the class probably represents more than 90% of all animal Species. Insects can be found in nearly all environments, although only a few species occur in the oceans. Spiders and scorpions, which can also be eaten by humans, are not insects but belong to the arthropods. Insects share the nutritional benefits of animal-source foods and can provide valuable nutrients as a part of a varied diet. Edible insect species may be a source of novel bioactive compounds addressing the enormous global health challenges in low- as well as high-income countries.

What is an Entomophagy?

The practice of consuming insects is called entomophagy, from the Greek éntomon, insect, and phagein, to eat.

What are edible insects?

Are all the insect types which are considered edible for human consumption consisting of about 2000 species.

Examples of commonly consume edible insects:
The insects most commonly consumed worldwide are beetles (Coleoptera, 31% of all insect species consumed), caterpillars (Lepidoptera, 18%) and bees, wasps and ants (Hymenoptera, 14%). Moreover, grasshoppers, crickets and locusts (Orthoptera, 13%) and cicadas, leafhoppers, planthoppers, scale insects and true bugs (Hemiptera, 10%) are consumed. Termites (Isoptera), dragonflies (Odonata), flies (Diptera) and other insects each comprise less than 3% of insects consumed.

LITERATURE REVIEW

Insects are institutionally accepted as a food in many regions and historically consumed (Bukkens, S.G.F. 2005), providing sufficient nutritional value for humans. The use of insects as a viable food group can be attributed to their nutritional, environmental, and economic value (Bukkens, S.G.F. 2009). The increased scrutiny of edible insects is part of a multifaceted strategies for achieving global food security. In general, insects have high protein content and excellent production efficiency compared with other conventional food groups; (Calderone, N.W. 2012). This characteristic is particularly valuable given that future protein consumption is expected to increase, but food supply declines. Moreover, it is recognized that a steady increase in the global market size of the insect industry, with applications reaching beyond food into material and drug development (DeFoliart, G.R. 2015). An interest in edible insects has increased rapidly because the Food and Agriculture Organization (Oonincx, D.G.A.B., van der Poel, A.F.B. 2011.) has begun promoting insects as viable dietary options for humans (Parajulee,

M.N., DeFoliart, and G.R., Hogg, D.B. 2014). Globally, the edible-insect market is expected to exceed USD 522 million by 2023 (Wiley-Blackwell,West Sussex, UK. Chittavong, M., Jansson A., Lindberg, J.E.2017).

RESEARCH METHODS

The method adopted for this research was using content analysis. During which different search strategies were used to access published articles to review literatures of some other authors in the field of applied entomology in order to trace significant value of edible insects as an alternative source of food to man and their values to his health as well. The search terms includes but not only limited to the following: what are edible insects, Are the edible insects valuable to man at all, do the edible insects contribute to bio economic growth etc. Lastly References in the identified articles were used, reviewed to draw conclusion that the edible insects have nutrional values to man's health, his economic growth and as an additional alternative food source to him.

RESEARCH QUESTIONS: The following important search questions could be ask in the course of this research:

1)What are edible insects?
2) What is an entomophagy?
3) What are the nutritional composition of insects that enable them to be use as human food supplements?
4) Are the insects important to human health?

FINDINGS AND DISCUSSION

Nutrient Composition of An Edible Insects that make them Valuable To Man:

The nutrient content of insects varies considerably between species and also between the different development phases. The amino acid profile differs between insect species, but it appears that many species may contribute well to an optimal diet for humans, even in very small children. Nevertheless, researchers generally agree that insects are extremely rich in protein, fat, and vitamins, as summarize as follow: On average, the protein content of edible insects ranges 35%–60% dry weight or 10%–25% fresh weight, which are higher than plant protein sources, including cereal, soybeans, and lentils. At the upper range, insects provide more protein than even meat and chicken eggs. Edible insects in Orthoptera (crickets, grasshoppers, locusts) are particularly protein-rich. However, insect protein digestibility is highly variable due to the presence of a hard exoskeleton. Orthoptera, Lepidoptera (caterpillars), cockroaches (blattodea), Isoptera (termites), Hemiptera, and Coleoptera (beetles, grubs) have the averaged fat content of 13.41%, 27.66%, 29.90%, 32.74%, 30.26%, and 33.40%, respectively. Larvae and pupae have more fat than adult insect. In addition, females are fatty than males. The averaged carbohydrate content of edible insects ranges from 6.71% (stink bug) to 15.98% (cicada). Some insects (e.g., grasshoppers, crickets, termites, and mealworms) are rich in iron, zinc, calcium, copper, phosphorus, magnesium, and manganese. It has been found that consuming insects can provide the high proportions of daily mineral recommendations for humans, particularly in

terms of iron. It has also been found that edible insects contain carotene, vitamin B1, B2, B6, C, D, E, and K.

Medicinal applications of Edible insects To Man's Health:

Antioxidants:
Several studies have reported antioxidant activity in insect species. Antioxidants, in principle, have the potential to prevent molecular damage in the human body, and foods rich in antioxidants have been considered potentially beneficial in the prevention of cardiovascular and other diseases.

Hypertension:
High blood pressure is one of the leading preventable risk factors for premature death and disability worldwide, affecting up to one third of the world's population. Angiotensin is a peptide hormone that causes vasoconstriction and a subsequent increase in blood pressure. An enzyme converts the hormone angiotensin I to the active vasoconstrictor angiotensin II. As a result, the angiotensin-converting enzyme (ACE) causes blood vessels to constrict, which is why ACE inhibitors are used as pharmaceutical drugs for the treatment of cardiovascular diseases. ACE inhibitory activity is widely distributed in mammalian tissues, and has also been identified in a number of insects. Species such as wax moth Galleria mellonella, the yellow mealworm Tenebrio molitor and the silkworm Bombyx mori have been found to have levels of ACE inhibitory activity comparable with other food sources.

Obesity and type 2 diabetes:
Studies in mice models have indicated bioactive compounds in insects, which may be effective in weight control. Study showed that the daily intake of yellow mealworm larvae powder by obese mice attenuated body weight gain by reducing lipid accumulation and triglyceride content in adipocytes, thus indicating the potential of a bioactive
compound to induce weight loss. Another pathway of bioactivity investigated entails a reduction in endoplasmic reticulum (ER) stress. ER is a cellular condition found in obese as well as type 2 diabetes patients causing a function failure of cells, including insulin-producing beta cells.

Chitin and immunity:
Chitin, a primary component of the exoskeletons of arthropods, represents the second-most abundant polysaccharide in nature, after cellulose. Humans do not synthetise chitin. Therefore, chitin-containing protozoa, fungi, arthropods, and nematodes are targeted for recognition by the immune system. Chitin and its degradation products are sensed primarily in the lungs or gut, where it activates a variety of innate and adaptive immune cells. Chitin induces cytokine production, recruits leukocytes, and activates macrophages. Chitin can be degraded by chitinases identified in the human digestive fluid. The function of chitinases is not only to catalyse the hydrolysis of chitin-producing pathogens, but seems to include a crucial role in bacterial infections and inflammatory diseases.

Vitamin B12:

Cobalamin – or vitamin B12 – is synthesised by certain bacteria and algae and accumulates in meat, milk and other animal-source food, as the only natural food source of vitamin B12 for humans. Vitamin B12 plays a key role in the functioning of the brain and nervous system and in the formation of red blood cells. Few insects have been analysed for vitamin B12. Among them house cricket Acheta domesticus, yellow mealworm T. molitor, wax moth G. mellonella, and silkworm B. mori.

Parkinson's disease and silkworm:

Parkinson's disease affects 6 million people each year, resulting in more than 100,000 deaths each year. Study found that when boiled and freeze-dried powder of the silk worm B. mori was fed to Drosophila flies, lifespan increased, while symptoms of rotenone-induced Parkinson's disease were reduced.

Medicine:

The traditional claims of medicinal properties have resulted in multiple studies aiming to empirically determine the properties of edible insects. Cultures that consume insects also tend to associate them with various health benefits beyond nutrition. For example, caterpillar fungus supposedly has immunostimulatory and anti-cancer properties. Some evidence exists to suggest that termites (Macrotermes annandalei) may have immunostimulatory effects. Another insect historically considered to have beneficial health effects is the silkworm (Bombyx mori L.). Recent analyses have identified a blood glucose-lowering agent, resulting in the development of silkworm powder as a diabetic medicine in Korea.

RECOMMENDATION

With the above findings, consumption of non-toxic edible insects by man is encourage as they play an important role in human nutrition and have much nutrients to offer.

CONCLUSION

The results of this study confirm the fact that insects are indeed a good source of protein and other nutrients. Therefore consumption of edible, non-toxic insects, should be encouraged, as they serve as an alternative nutrition source in human diets like protein supplements, have much nutrients to offer and can also be use boost economic growth as well.

FURTHER RESEARCH

With this research findings further research is highly recommended more especially on the chemical composition of edible insects which is not covered in this study.

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