BANGLADESH SOCIETY FOR PHARMACEUTICAL PROFESSIONALS

Engagement for A Better Tomorrow

Annual General Meeting 2021

DATE: 22 OCTOBER, 2021, FRIDAY

VENUE: Hotel Purbani, Motijheel, Dhaka

KEYNOTE:

Dengue, Bangladesh Context and New Horizons In The Treatment of Dengue induced thrombocytopenia

281/1, Road # 19/, New DOHS, Mohakhali, Dhaka-1212

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Organized by:

BANGLADESH SOCIETY FOR PHARMACEUTICAL PROFESSIONALS

Engagement for A Better Tomorrow

PROGRAM SCHEDULE

INAUGURAL SESSION

03:30	☞	Seating of guests
03:40	☞	Recitation from the Holy Quran
03:45	☞	Inaugural Speech of Convener, AGM Organizing Committee & Vice President, BSPP
03:55	☞	Scientific Seminar entitled **"Dengue, Bangladesh context and new horizons in the treatment of dengue induced thrombocytopenia"** Speaker: **Professor Dr. A.H.M. Nurun Nabi,** Department of Biochemistry and Molecular Biology, DU
04:15	☞	Discussion on the scientific paper
04:30	☞	Address by Special Guest **Professor Dr. Firoz Ahmed,** Chairman, Microbiology, NSTU
04:40	☞	Address by Special Guest **Dr. Mohammad Mushtuq Husain,** Advisor (IEDCR)
04:50	☞	Address by Chief Guest **Professor Dr. Md. Aftab Ali Shaikh,** Chairman (BCSIR)
05:00	☞	BSPP President's Speach
05:10	☞	Awarding
05:15	☞	Vote of Thanks by Secretary General (acting)
05:20	☞	Tea Break & Magrib Prayer

BUSINESS SESSION

06:00	☞	Business Session of AGM 2021
06:45	☞	Election for the Period 2021-2024
07:30	☞	Dinner

PLEASE WEAR A FACE MASK

KEEP SAFE DISTANCE

"We Remember You"

The Souvenir Is Dedicated To

LATE MOHAMMAD JAWAID YAHYA

Formar Secretary General, **BSPP**

BANGLADESH SOCIETY FOR PHARMACEUTICAL PROFESSIONALS

Engagement for A Better Tomorrow

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Executive Council Member

MESSAGE FROM **CHIEF GUEST**

Professor Dr. Md. Aftab Ali Shaikh
Chairman
Bangladesh Council of Scientific and Industrial Research (BCSIR)

It gives me immense pleasure to know that the Bangladesh Society for Pharmaceutical Professionals (BSPP) is going to organize its Annual General Meeting-2021 and a seminar on an important and relevant topic "Dengue, Bangladesh context and new horizons in the treatment of dengue induced thrombocytopenia" on 22 October, 2021.

Bangladesh is celebrating the birth centenary of its founder and the Father of the nation Bangabandhu Sheikh Mujibur Rahman. I would like to pay tribute to him, his departed family members and his political colleagues at the beginning of my message.

I know about the organizational and professional activities of BSPP and the pivotal role that they are playing in the multi-disciplinary pharmaceutical sector. This association is made up of professionals from different disciplines of science and other subjects who have taken up the pharmaceutical sector to pursue their career.

In today's world, pharmaceutical science has advanced a lot. So, without the expertise in various disciplines, pharmaceutical sector of the country will not be able to keep pace with the developed world.

To make the industries in this sector more efficient, vibrant and contributory to the development of the country, we need to follow the WHO guideline relating to qualified personnel for pharmaceutical sector and that should also be reflected in our regulatory laws. These industries need chemists, applied chemists, biochemists, microbiologists, biotechnologists, pharmacists and engineers.

So there is no alternative of working together in a respectful way in the development of the pharmaceutical sector in Bangladesh.

I do strongly believe that all the members of BSPP will move forward to meet the challenges of the future and contribute to the development of Pharmaceuticals.

At this auspicious time of the Annual General Meeting of BSPP, I do congratulate all who are involved with the association.

I wish success to the Annual General Meeting, 2021 and good health to all in the organization.

MESSAGE FROM **SPECIAL GUEST**

Dr. Mohmmad Mushtuq Husain
Advisor
Institute of Epidemiology, Disease Control and Research (IEDCR)

I am very happy to know that Bangladesh Society for Pharmaceutical Professionals (BSSP) is arranging a seminar and AGM on 22nd October, 2021. It is really a matter of great satisfaction that BSPP could come out of the world wide problem of COVID-91 and restart the activities of the society. The havoc caused by the pandemic is unparalleled, as almost 5 million people in the world have died due to COVID-91. Pharmaceutical Industries in many parts of the world are trying to fight the new strain of the virus. It is a great scientific achievement that vaccines were produced with a unprecedent speed and provided to the people.

But equity could not be ensured for the low and middle income countries of the world in terms of accessibility of vaccine, though scientific invention of it is a universal public good. in spite of such challenges and unfairness on the part of many high income countries and manufacturers, Bangladesh is doing reasonably well in procuring vaccines. I hope our Pharmaceutical Industry will also be successful in innovation and production of vaccines and therapeutics to combat COVID-19 tand contribute to build back better Bangladesh.

I wish BSPP a successful Seminar and AGM-2021.

MESSAGE FROM **SPECIAL GUEST**

Prof. Dr. Firoz Ahmed
Chairman
Department of Microbiology
Noakhali Science and Technology University

I am very happy to know that Bangladesh Society of Pharmaceutical Professionals is going to arrange its Annual General Meeting. This is worth mentioning that the dynamics of pharmaceutical concepts is changing over time.

By 2040, some diseases will be prevented, cured, or managed with nonpharmacological interventions. If that vision is correct, we could have fewer people with chronic diseases and less need for therapies that treat those conditions. As a result, what has historically been in-bounds for the pharma sector—such as the treatment of chronic diseases—could erode. “If pharma wants to survive, they should broaden themselves significantly,” said one former executive of a global pharmaceutical company.

When we look back on the sector 20 years from now, we may describe our current approach to disease and treatments as crude. Pharmaceutical companies that are able to reimagine their traditional business model may be most likely to succeed in a future built around prevention, early detection, and personalized therapies.

We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before. We do not yet know just how it will unfold, but one thing is clear: the response to it must be integrated and comprehensive, involving all stakeholders of the global polity, from the public and private sectors to academia and civil society.

The First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution is building on the Third, the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.

There are three reasons why today’s transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope, and systems impact. The speed of current breakthroughs has no historical precedent. When compared with previous industrial revolutions, the Fourth is evolving at an exponential rather than a linear pace. Moreover, it is disrupting almost every industry in every country. And the breadth and depth of these changes herald the transformation of entire systems of production, management, and governance.

MESSAGE FROM **PRESIDENT**

Prof. Ishtiaq Mahmud, Ph.D
President
Bangladesh Society for Pharmaceutical Professionals

The people around the world have passed through a difficult period of two years due to COVID-19 pandemic and we are no exception to the fact. Although we decided to hold our AGM a year back but the pandemic situation did not permit us to do so. Some of our dear colleagues lost their lives during this period. The loss of our beloved Secretary General Mr. Mohammad Jawaid Yahya, in 2018 was a serious blow to our organization.

We could not do the jobs of the society properly because of lockdown and other reasons related to COVID-19. We could not have most of our planned activities except EC meetings, some training programs and picnic. However I am glad that finally we could manage to organize the belated AGM of our society.

The trend in the Pharma sector is changing as they are busy in dealing with the vaccine and other medicines related to COVID. Physicians are busy dealing with the symptoms as it is a new virus. Medical researchers are dealing with the medicines and possible therapy for the new virus. The pandemic showed us the vulnerability of mankind. However, we seem to be lucky that the COVID probably is fading away. I think time is coming that we spend our time & energy to develop e ective pharma world to combat the problems of different viral diseases. I feel the world will not be same again.

However, BSPP always try to keep its members aware about the new developments in Pharma sector through seminar, symposium and training program. I assure you that we will continue to do so in the coming days.

I would like to thank all the EC members for their sincere effort and hard work to make this AGM a success. May Allah keep us all in good health .

I wish BSPP a successful AGM and seminar. I wish also its members a happy and prosperous new beginning after the pandemic.

ORBITUARY NOTE

From the minute we were born to the moment we take our last breath, there is that little time in between it all that we call life. Though change is the only thing constant in this world, the concept of losing someone forever is something that's difficult to grasp. Over a period of years some of our colleagues and fellow members have left us for good for the eternal world. (Innalilla he wa Inna elaihe rajeoon). Particularly within the last three years we have lost some of our very veteran professional colleagues and fellow members of BSPP namely:

"We Remember You"

LATE ATA-E-MOULA
LM 0001

LATE JAWAID YAHYA
LM 0002

LATE M.A. AZIZ
LM 0015

LATE SARABINDU K. SAHA
LM 0076

LATE NASIR UDDIN
LM 0090

LATE RABIUL HASAN
LM 0094

Their death has left us all completely grief stricken, in a state of confusion and wilderment. While writing this obituary note I am getting it difficult, assembling words with feelings. Their contribution to the BSPP was immense and their care for their fellow members, will always be missed by us.

Their legacies will live on in the hearts and minds of each one of us and in the hearts and minds of everyone they interacted with.

We can only pray to Allah (SB), for their departed souls to grant them a place in Jannatul Ferdous. Ameen

KEYNOTE

Dengue, Bangladesh context and new horizons in the treatment of dengue induced thrombocytopenia

Dr. A.H.M. Nurun Nabi
Professor
Department of Biochemistry and Molecular Biology
University of Dhaka

Dengue is a mosquito-borne viral infection that causes deadly flu-like illnesses and sometimes deadly complications. About half of the world's population is at risk of dengue and it affects children and adults. The incidence of dengue has increased 30 times in the last 50 years. Every year, five to ten million people in more than hundred countries around the world are infected with dengue.

Aedes aegypti mosquito is the main vector of the dengue virus. The virus is transmitted to humans through the bite of a female Aedes mosquito. These mosquitoes transmit the virus mainly to themselves when they eat the blood of an infected person. The full life cycle of the dengue causing virus depends on its main carriers, mosquitoes and the main victims of infection. Once infected, humans are the main carriers of the virus and help spread the virus. These infected individuals later act as the source of the virus in uninfected mosquitoes. The virus enters the infected person's bloodstream in about 2 to 7 days, at which time the person develops a fever.

Symptoms and complications of Dengue

The clinical features of dengue fever vary according to the age of the patients. Dengue fever usually causes high fever (40°C/104°F) and has at least two of the following symptoms:

- Severe headache
- Pain behind the eyes
- Feeling sick
- Vomiting
- Swollen glands
- Muscle and joint pain
- Rash, which appears two to five days after the onset of fever.

Dengue virus infection can be divided into three categories. Dengue fever, dengue hemorrhagic fever and dengue shock syndrome. This guideline was issued by the World Health Organization in 1985 and continued till 2009. Dengue starts abruptly after an incubation period of 5 to 7 days which follows three phases - Febril, Critical and Convalescent. In Febril, bleeding is seen along with various common symptoms. The most important clinical indicator of this stage is thrombocytopenia, which is an excessive loss of the number of platelets. Plasma leakage, on the other hand, is one of the critical indicators that complicates the patient's condition. And at the convalescent stage, the patient's condition gradually begins to improve.

Dengue and Bangladesh context

Bangladesh is one of the countries affected by dengue virus. Dengue fever in Bangladesh started in tback East Pakistan in 1964. At that time it was known as “Dacca Fever”. It later became known as dengue fever. In the 35 years from 1984 to 1999, a total of about five and a half thousand people were infected with the dengue virus. Outbreak of dengue fever occurred in our country in 2000. A total of over six and a half thousand people were infected with dengue in that year and many died. Subsequently, in one year the dengue infection has increased while in the next year its incidence has decreased. The analysis of dengue cases in Bangladesh from 2000 to 2017 showed that the incidence of dengue was 49.63% in the monsoon season (May-August) and 49.22% in the post-monsoon season (September-December). The analysis of the data also showed that these trends had been changing since 2014 and there were reports of dengue cases during the pre-monsoon season. The incidence of dengue in the pre-monsoon season from 2015 to 2016 was seven times higher than in the last 14 years. The dengue situation in Bangladesh is creating an economic burden on our health sector. According to the survey results of the Bangladesh National Health

Account, as the health budget allocation is gradually declining and at the same time out-of-pocket expenditure is increasing (8%, which is highest in Southeast Asia), the healthcare system may be at greater risk in our socio-economic context.

Treatment in Dengue

There is no specific treatment for dengue fever. If there is pain, acetaminophen can be used to relieve the pain. It is better to avoid aspirin-containing drugs or as it can make bleeding worse. Patients need to rest and drink plenty of fluids. Someone with severe dengue fever may need hospital help, intravenous fluid and electrolyte replacement, blood pressure monitoring, blood transfusion replacement.

We are in dengue research

In 2019, the country, specially the people of Dhaka, was suffering from dengue attack. Everyone involved in health care was in a state of shock. There was lack of space in the hospitals and everybody was worried about treatment. And the thoughts of ordinary people like us was about managing blood for beloved dengue infected individuals. If platelets are reduced, blood should be replaced. But, is it possible for everyone to manage blood? Again, the attack of deadly pathogens does not keep quite. At such a moment, a drug called eltrombopag was applied to increase the platelets of a serious dengue patient in Dhaka Medical College Hospital who had no other complications. The patient recovered quickly. As a result of this finding, four more helpless patients were treated in the same way. Finally, out of five patients, two responded very well, two showed fair results and one did not respond as expected. Having observed such inspired effectiveness and response of eltrombopag against dengue, the doctors discussed the matters with us to find out the probable reason of such response. Thus, teachers and students of the University of Dhaka and Dhaka Medical College Hospital conducted a Phase II Clinical Trial to prove the safety and efficacy of eltrombopag on dengue patients.

Eltrombopag, a joint venture between GSK and Novartis, a UK and Switzerland based pharmaceutical company, was initially used only to correct immunomodulatory thrombocytopenia or chronic liver disease. But due to the similarity of the symptoms, the study was planned to test the efficacy of the drug to solve the dengue-caused thrombocytopenia. In modern medical science this type of technique is called drug repurposing or reprofiling or rearrangement of the purpose of drug where a drug is used to cure a duplicate disorder outside of its original field of application. This was an open-label, randomized controlled phase-II clinical trial. The study was conducted on 108 patients without comorbidities or liver abnormalities. Patients were randomly divided into group-1, (36), group-2 (36), or control-group (36). Two doses of eltrombopag - 25 mg / day and 50 mg / day were given to group-1 and group-2 patients, respectively, where control group patients received conventional (standard) dengue treatment without eltrombopag. The management of all enrolled patients was conducted in accordance with the guidelines of the World Health Organization.

CBC and immature platelet fraction (IPF) were observed from the day of enrollment to the seventh day. Absolute Immature Platelet Count or A-IPC was calculated. Aspartate aminotransferase (AST) and alanine aminotransferase (Alanine aminotransferase, ALT) were measured from the beginning to the fourth day and an abdominal ultrasonogram (USG) was performed for each patient from the beginning to the fourth day. From the day of enrollment to the seventh day, the ability to retrieve the number of platelets (the number of platelets above the normal range below: $150x10^9$/L) was considered to be the primary efficacy of the eltrombopag test. Liver Function enzyme AST / ALT and USG were used to evaluate whether the drug is safe.

A comparison of the blood parameters of dengue patients during their enrollment has been presented in Table-1. Initially, no significant differences were found between the blood parameters of the enrolled patients. On the day of enrollment of patients, the average number of platelet was estimated to be approximately 60 x 10^9/L.

Table-1. Basic features of blood parameters during enrollment of dengue patients.

Groups	Group 1	Group 2	Control -group
Eltrombopag	25 mg/D	50 mg/D	Nil
Age (Years)			
Median (Interquartile range)	25 (20–35)	26 (23–35)	28 (23–33)
Mean (SD)	26 (8)	30 (10)	30 (9)
Sex			
Male	26 (79%)	22 (63%)	26 (79%)
Female	7 (21%)	13 (37%)	7 (21%)
Baseline PLT $\times 10^9$/L			
Mean (SD)	58 (24)	52 (29)	55 (30)
Baseline IPF (%)			
Mean (SD)	10.71 (4.25)	12.82 (5.31)	13.08 (4.58)
Baseline A -IPN			
Mean (SD)	5.74 (2.62)	6.10 (3.68)	6.64 (3.65)
Baseline Hct (%)			
Mean (SD)	40 (4)	41 (5)	42 (6)
Baseline BP (mmHg)			
Systolic Mean (SD)	104.54 (5.05)	106.28 (19.14)	102.87 (8.38)
Diastolic Mean(SD)	73.63 (6.76)	73.14 (13.93)	72.27 (4.85)
Bleeding Manifestations (%)	9 (27%)	5 (14%)	7 (30%)
Days from onset of fever			
Median (range)	4 (2 –8)	4 (2 –9)	4 (2 –8)
Mean (SD)	4.15 (1.50)	4.28 (1.50)	4.303 (1.23)

(Chakraborty et al., 2020)

The average number of platelets in group-1 (332 × 10^9/ L ± 92) and group-2 (361 × 10^9/L ± 111) after administering eltrombopag was significantly higher compared to the individuals (194 × 109/L ±96) who received standard treatment (Figure 1A). Ninety-one percent (91%) of the patients of group-1 and group-2 had more than the normal threshold (150 x 10^9/L) levels of platelets than fifty five percent (55%) of the patients in the control group who did not receive the eltrombopag (Figures 1B, C and D). The average A-IPC was significantly higher in patients receiving eltrombopag (Figures 2A and B). On the seventh day, the average number of platelets of seven patients receiving 25 mg/D (group-1) and three patients receiving 50 mg/D (group-2) were found to be above the normal range (450 × 10^9/L ± 97). The prevalence of the most common adverse reactions (propensity to vomit and diarrhea) was the same among patients receiving the drug and in the control group.

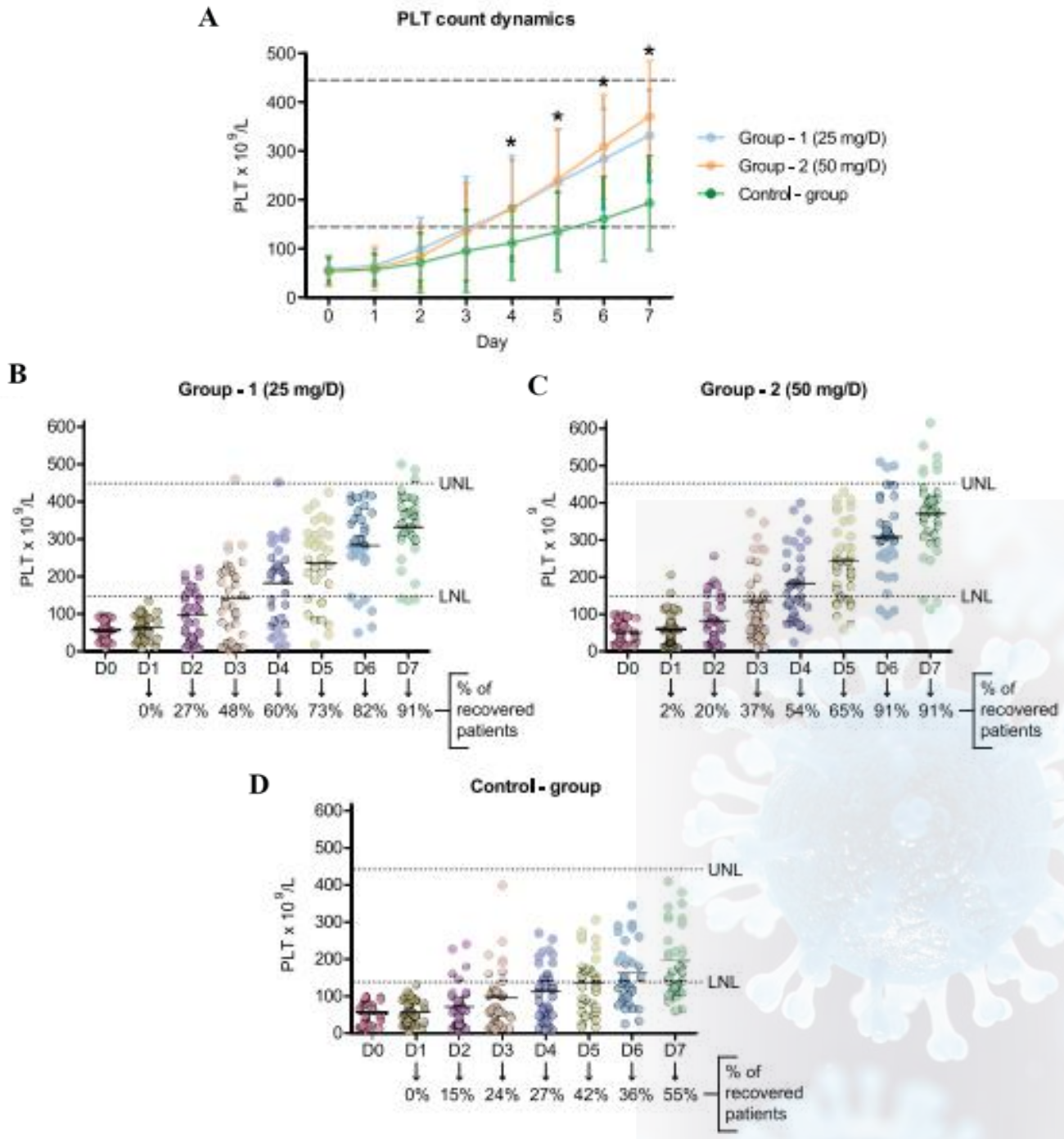

Figure-1. The average number of platelets and the average dynamics of change of platelets. The number of patients receiving the drug from the day of enrollment to the seventh day and the number of patients in the control group. From Day-0 to -3, the mean platelet counts among the three groups were not significantly different. From Day-4 and onwards, the mean platelet counts were significantly higher in Group-1 and Group–2 compared to Control-group. (B), (C), (D) represent the Day-wise proportion of the platelet -recovered patients (with the count above than lower normal limit) in Group-1 (B), Group-2 (C), and Control-group (D) (Chakraborty et al., 2020).

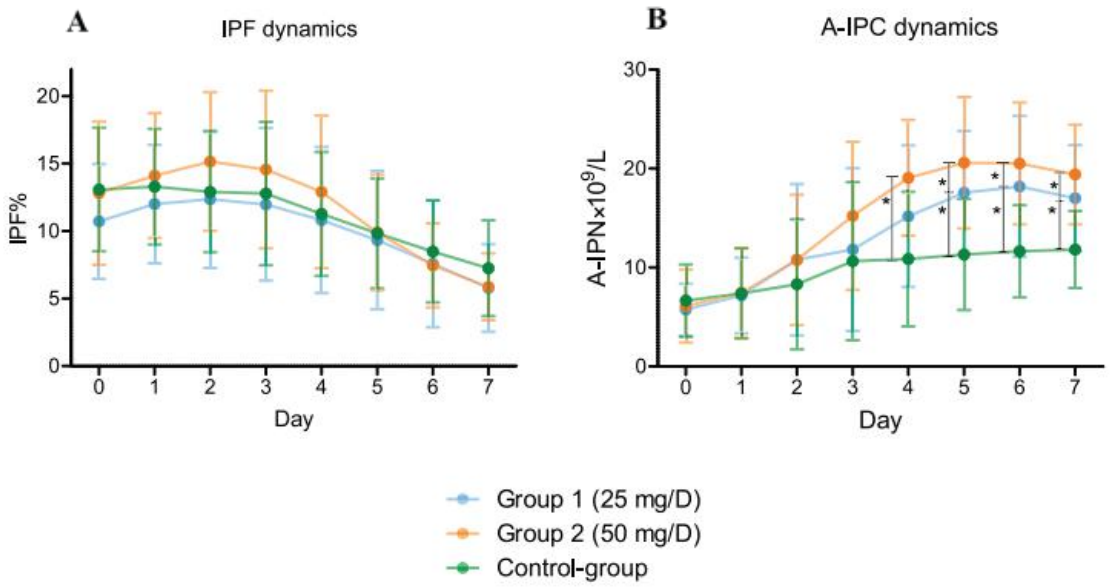

Figure-2. The average (A) immature platelet fraction (IPF) and (B) absolute immature platelet fraction (A-IPF) of the patients receiving the drug and standard treatment, the control group (Chakraborty et al., 2020).

Pharmacogenetic study to evaluate drug efficacy and response

Previous clinical trials using eltrombopag in patients with Immune Thrombocytopenia Purpura, Severe Aplastic Anemia, and Chronic Liver Disease found positive responses in 61%, 40%, and 61% of patients, respectively while our study found 91% positive response. The question is, where does the difference in drug response come from? Is it due to differences in DNA? We are also searching it.

The thrombopoietin receptor (TPO-R), is expressed on the cell and its natural ligand, thrombopoietin binds to the extracellular domain while eltrombopag binds to its transmembrane domain. The thrombopoietin receptor protein is encoded by the MPL gene, which is located on chromosome 1 and it contains 12 exons. Thrombopoietin plays very significant role in thrombopoiesis that acts as the chief regulator of megakaryocyte (MK) and platelet production, signaling via its receptor, TPO-R). A total of eight primers were designed to examine the DNA sequence of the entire exonic regions of this gene in all study participants, followed by optimization of the conditions for Polymerase Chain Reaction (PCR) to amplify the specific DNA regions. About one thousand sequences were analyzed. A total of 17 different SNPs were found by analyzing the sequence of exonic regions of the MPL gene, 11 SNPs of which were new to our population. Changes in these 17 types of nucleotides cause changes in amino acids that can alter the function of proteins as a result of changes in protein structure. Based on the response, i.e. how fast the number of platelets was corrected, the patients receiving the drug were divided into high responder, intermediate responder and low responder. At the end of the test, 44.1% of them were found to belong to the high respond, 33.6% to the moderate respond and 22.1% to the low respond groups. The frequency of S129R and E336Q among the modified amino acids was found to be highest in the high respond and moderately respond patient groups but no such change was found in the low responders. Sequence analyses revealed that 5913T>G (S129R) variant containing control group patients had significantly lower rate of platelet recovery which began to become normal from day five. (Figure-3). On the other hand, the number of patients receiving the drug with the same difference began to return to normal by the third day.

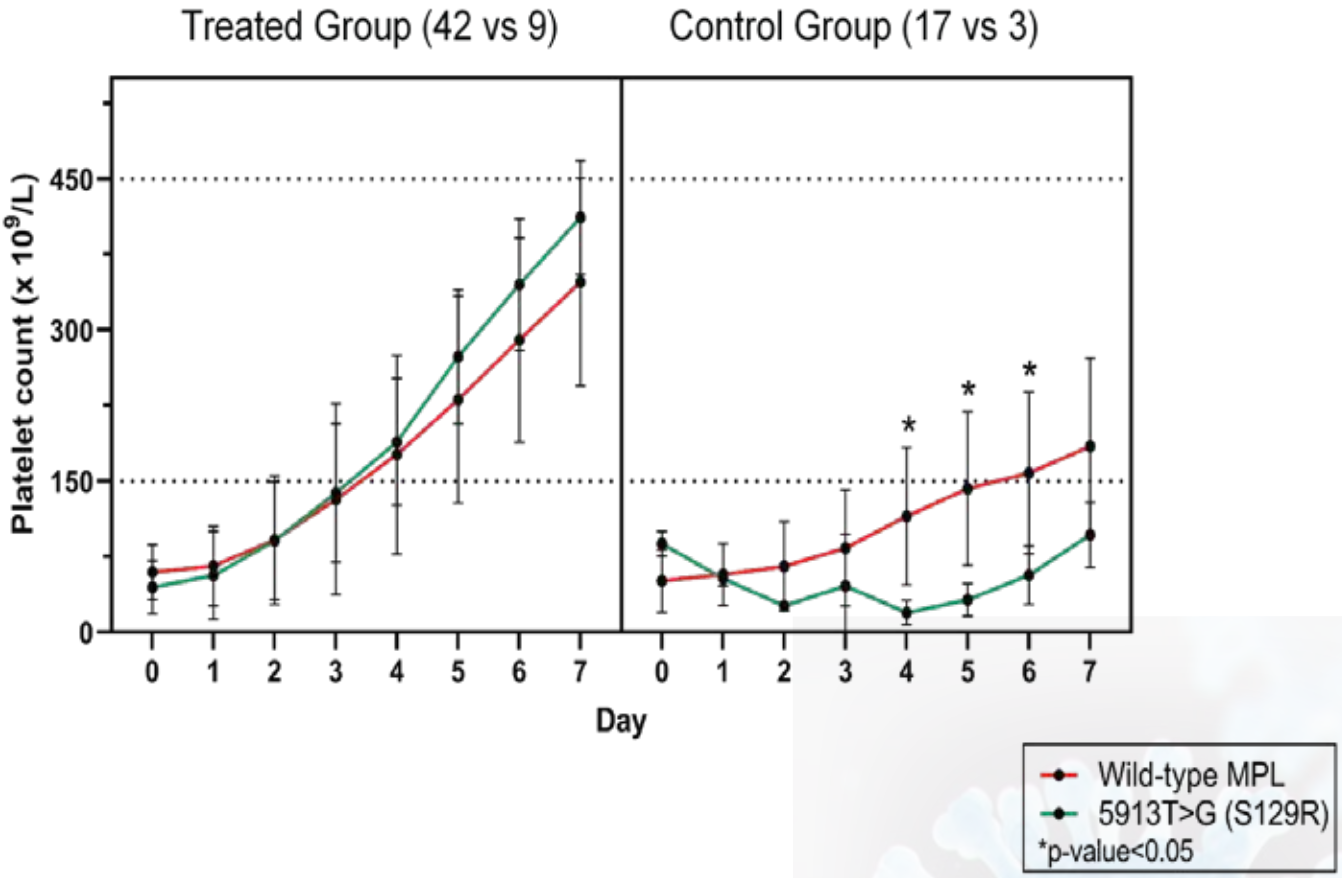

Figure-3. Patients with 5913T>G (S129R) differences in the control group had significantly lower rates of nucleation correction. But the number of cycles of patients receiving drugs with the same variation began to return to normal from the third day (unpublished data).

To further explore the reasons for the differences in drug responses with genotypes, we docked and simulated the dimerized structure of whole proteins with and without new amino acid variations using computational algorithms (Figure 4). Analysis of the interacting residues of the dimers showed that, in the wild type TPOR dimer, eltrombopag formed one hydrogen-bond (H-bond) of length 2.8 Å with H499 and two Pi-Sigma bonds with L502 and V507 as well as Van der Waals interaction with multiple other residues (Figure 4A). Compared to the wild type TPOR dimer, eltrombopag interacted differently with the variant TPOR dimers. At least one type of binding interaction with H499 was observed in all cases. Pi-Alkyl interactions were observed between eltrombopag and L500R and S505T TPOR variants, while H-bonds similar to the wild type TPOR-eltrombopag was observed in the L504R variant (Figures 4B, C, D). Weak Van der Waals interaction was observed between eltrombopag and the TPOR variant carrying double mutations (L500R+L504H) (Fig 4E). The R500, H504 and T505 of the L500R, L504H and S505T variants were found to directly participate in interaction with eltrombopag, forming single Pi-Alkyl, Pi-Pi Stacked and H-bond with eltrombopag, respectively (Figures 4B, C, D).

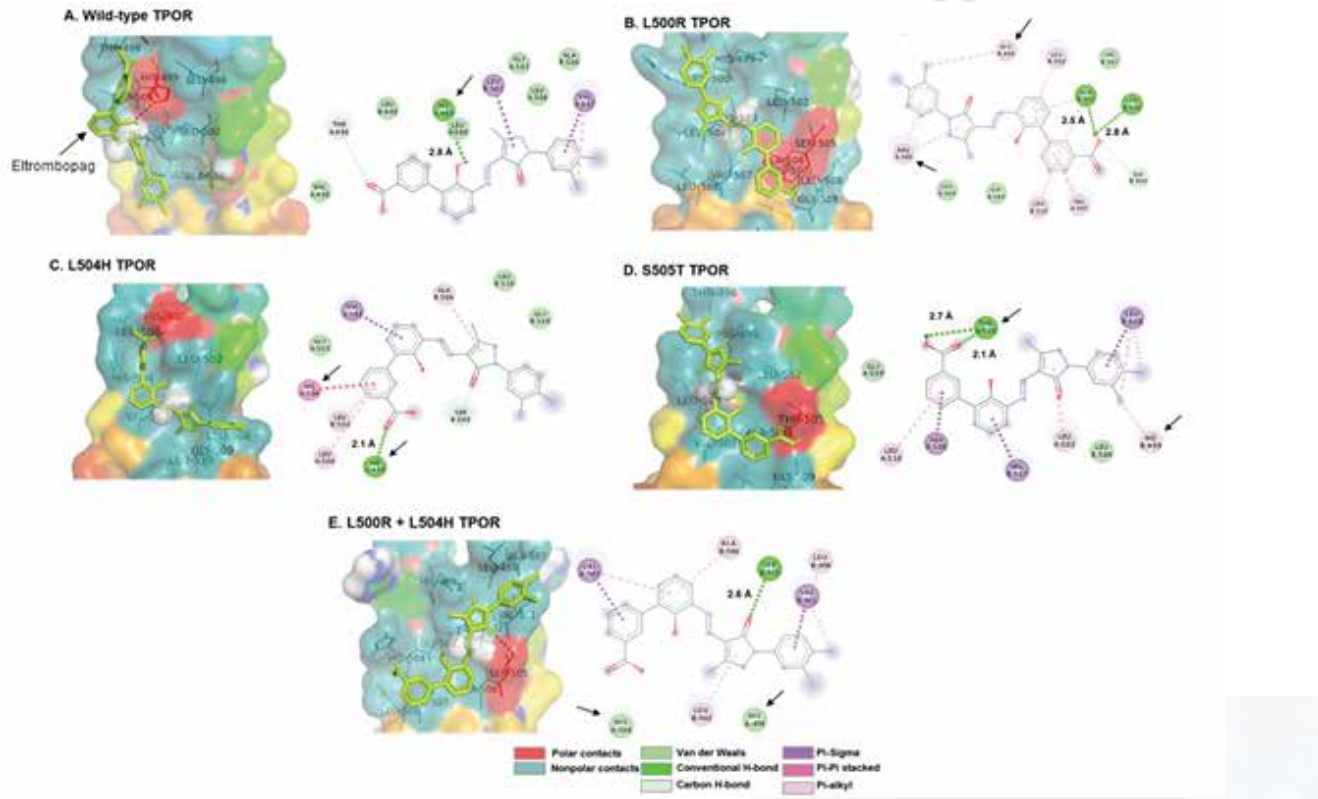

Figure 4. Interactions of eltrombopag with the wild type (A) and variant (B-E) TPOR moieties. In the 3D map (left), the polar and nonpolar contacts between eltrombopag and TPOR are represented as red and dark green colored regions. In the 2D map (right), interaction of eltrombopag with the critical H499 residue and the respective mutant residues are indicated with black arrows. The length of the H-bonds is given in Å (angstrom) (unpublished data).

In the Control group, patients harboring the S129R variant in the extracellular domain of the TPOR exhibited significantly different mean platelet counts at Day-4, 5 and 6 of the study compared to wild type TPOR carriers in both treatment groups or control group. to understand the impact of this variant on the structural dynamics of TPOR, we performed molecular dynamics (MD) simulation for this variant carrying TPOR extracellular domain and compared the root mean square deviation (RMSD) trajectory with the trajectory of wild type TPOR ECD (Fig 3.5B). The RMSD trajectories of both proteins follow almost similar path till 0.8 ns, after that the proteins begin to diverge and the S129R trajectory moves downward and around the 1.0 ns timepoint the wild type TPOR exhibits RMSD ~6.0 Å while the S129R variant shows a stabilizing trend at ~4.9 Å.

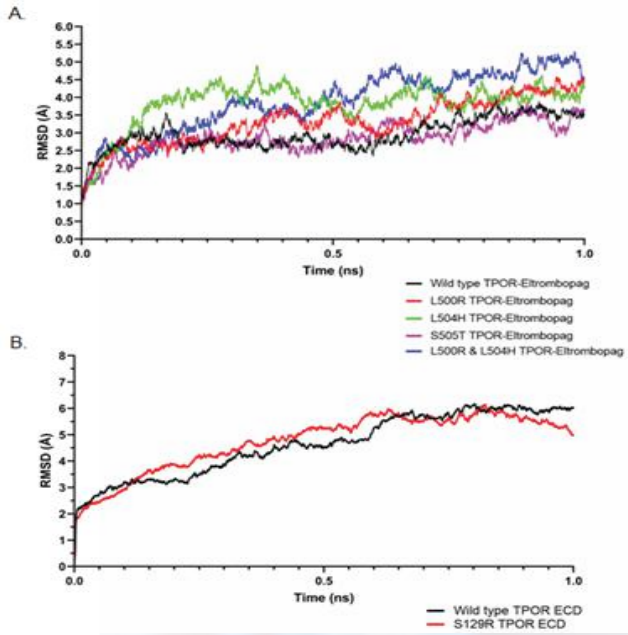

Figure 3.5. RMSD trajectories of the (A) eltrombopag-TPOR transmembrane domain complexes, and (B) extracellular domain of native and variant (S129R) TPOR. The x-axis indicates the time (ns), and the y-axis indicates the RMSD (Å) (unpublished data).

In conclusion, the higher number of A-IPCs in eltrombopag treated patients highlighted the possible mode of action of eltrombopag through stimulating megakaryopoiesis in dengue patients. Our pharmacogenetic study has evaluated the implications of the *MPL* genotype on determining the response to eltrombopag in patients with dengue-induced thrombocytopenia. The outcome of this study indicates that the presence of variations in the *MPL* gene, especially in the coding sequence of the drug binding transmembrane domain, may lead to patient-specific differential responses to eltrombopag. Before translating into clinical settings, the results call for validation in larger sample size, preferably in the phase-III of the clinical trial, integrating the pharmacokinetic elements and in vitro assessment of the *MPL* variant effects imparted on the pharmacodynamics of eltrombopag.

Acknowledgement

This study was conducted using a research grant provided by the Incepta Pharmaceuticals Limited, Bangladesh. I want to express my heartfelt gratitude to Dr Sajib Chakraborty, Associate Professor, Department of Biochemistry and Molecular Biology, University of Dhaka; Professor Dr Ahmedul Kabir, Professor Dr Robed Amin, Dr Mousumi Sanyal of Dhaka Medical College Hospital (DMCH) for their unconditional support during patient enrollment and special thanks to Dr Chowdhury Tamanna Tabassum of DMCH and Dr Mohammad Sayem of Aichi Medical College, Dhaka, Bangladesh for their help during the study. My sincere acknowledgement to Mr Mohammad Sayem and Md Saruar Alam, MS students of the Department of Biochemistry and Molecular Biology, University of Dhaka. I also want to thank Ms Bartholomia K Byapari of Square Hospital, Dhaka, Bangladesh.

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COVID-19 testing in Bangladesh: lessons learned from an ongoing global pandemic

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Nearly one and half years into the pandemic, where does Bangladesh stand in tackling one of the largest pandemics in modern history? The tale started with a small outbreak of a mysterious, viral pneumonia in Wuhan city, China. The virus causing the disease was later identified as a novel serotype of coronavirus, the 7th coronavirus known to infect humans and the 3rd coronavirus known to cause epidemics. The virus was named as severe acute respiratory syndrome 2 (SARS-CoV-2) considering that the virus is closely related to the coronavirus that was responsible for 2003 SARS pandemic. The disease caused by SARS-CoV-2 was named as coronavirus disease 2019 (COVID-19). The outbreak originating in Wuhan rapidly spread to many countries of the world, and on March 11, 2020 World Health Organization (WHO) declared it a pandemic. The first few cases of COVID-19 were detected in Bangladesh in early March 2020. Since then, Bangladesh has experienced a protracted first wave that continued up to the end of December 2020 and a relatively shorter but more pronounced second wave between March and April 2021. As of early May there were approximately 800,000 confirmed COVID-19 cases and 12,000 deaths associated with the diseases based on official estimates.

Since the beginning of COVID-19 outbreak, in the absence of pre-existing immunity against the novel virus and no vaccine or treatment available for the disease, the only strategy that has been universally applied to manage the pandemic is 'test, trace and isolate'. Identification of COVID-19 cases by laboratory tests was not only crucial for the management of COVID-19 patients but also for the overall management of the pandemic through surveillance and isolation of positive cases to prevent the transmission of the virus. In principle, viruses can be detected by i) viral culture ii) electron microscopy iii) antigen detection iv) antibody detection and v) molecular tests. Viral culture and electron microscopy is no longer used for routine detection of viruses because of the complexity of the tests and longer turn-around time. Antibody tests in most cases provide retrospective diagnosis and are therefore unsuitable for the diagnosis of acute infections. Antigen tests often suffer from poor sensitivity and specificity. Therefore, molecular tests that are rapid and are highly sensitive and specific are now the most preferred methods for viral detection in the developed countries. Soon after the viral genome sequences were available in mid-January 2020, detection of viral RNA in nasopharyngeal specimens by reverse transcriptase quantitative polymerase chain reaction (RT-qPCR) has been established as the gold standard method for the diagnosis of active COVID-19 cases. Assay protocols developed by center for disease control from several countries and research laboratories were published on the website of WHO, so that the test laboratories across the world can replicate these as home-brew tests in the absence of commercial tests. However, early in pandemic, no such preparation or efforts were noted in Bangladesh to replicate, evaluate or establish those home-brew tests which could have given the country a greater capability to screen returning international travelers for COVID-19.

Institute of Epidemiology Disease Control and Research (IEDCR) is the main responsible body in Bangladesh to predict and prepare for communicable disease outbreaks and carry out necessary epidemiological research and surveillance. In early March 2020, after the detection of first 3 cases of COVID-19, IEDCR conducted its first

press conference and declared that they are ready for the pandemic with only 1500 commercial COVID-19 test kits in hand. Testing capacity was limited to approximately 200 specimens per day and was centralized to IEDCR only. Permission for COVID-19 PCR outside of IEDCR was granted towards the end of March. Thanks to the dedications from the Biochemists, Microbiologists and other related professionals who volunteered to help rapidly expanding and decentralizing RT-qPCR facilities across the country. It is because of their relentless efforts the country now has more than hundred RT-qPCR facilities with a cumulative, maximum capacity of approximately 30,000 tests per day. Yet the number of tests performed per thousand people in Bangladesh is very low. According to the estimates provided in Our World in Data the number of tests performed in Bangladesh per thousand people is about one tenth of neighboring India and lower than one hundredth compared to some of the rich countries (Figure 1A). Furthermore, the positivity rate remained >10% most of the time, which is way above the WHO criteria to say that the epidemic is under control (Figure 2).

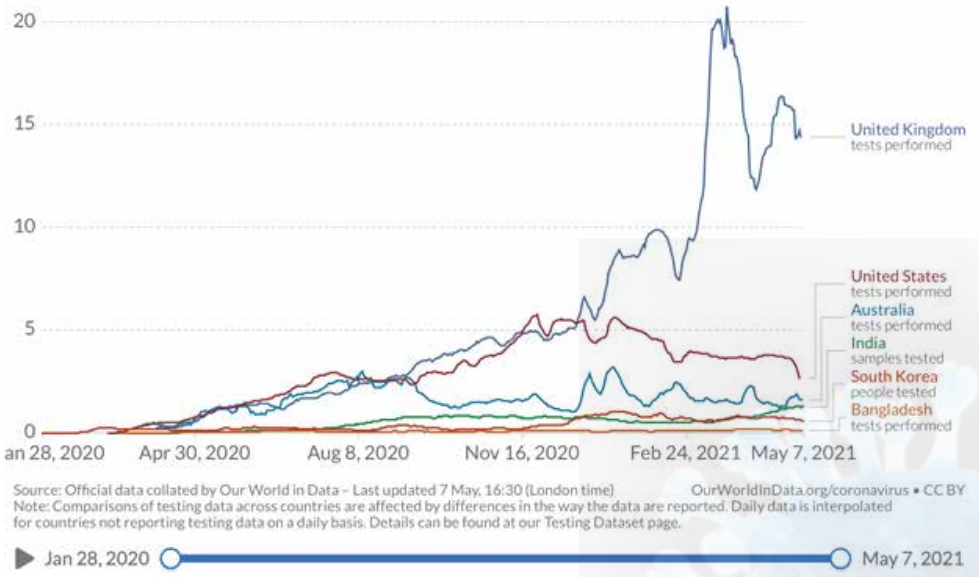

Figure 1: Daily COVID-19 tests per thousand people. Rolling 7-day average (source: https://ourworldindata.org/coronavirus-testing#the-positive-rate-a-crucial-metric-for-understanding-the-pandemic)

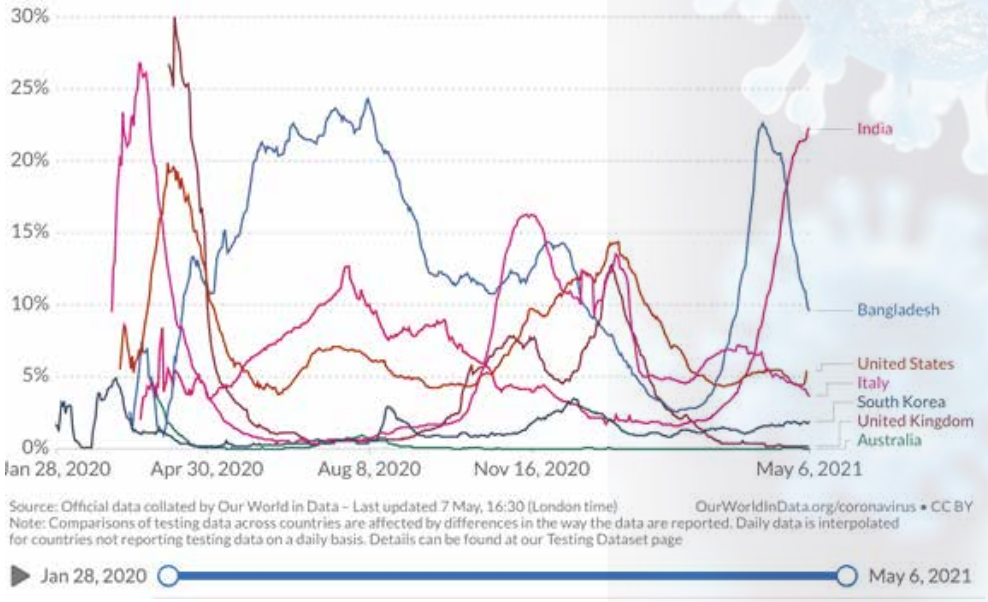

Figure 2: COVID-19 test positivity rate. Rolling 7-day average (source: https://ourworldindata.org/coronavirus-testing#the-positive-rate-a-crucial-metric-for-understanding-the-pandemic)

While it is understable that there is limitation of resources in Bangladesh, but the bigger problem may have been that available resources were not utilized in the most efficient manner. Over-reliance on imported test kits and reagents delayed testing and hampered the ability of the country to scale-up testing capacity. RT-qPCR is not a new method theoretically or practically. This is not an unfamiliar method to teachers, researchers or students involved in molecular biology, biochemistry, microbiology or other related subjects in Bangladesh. Laboratory developed clinical RT-qPCR assays can be newly designed or replicated based on published assays and validated against a gold standard method. If the test performance is equivalent or superior to the reference method in terms of sensitivity and specificity, the test can be implemented to significantly reduce the cost. In case of SARS-CoV-2, assay protocols recommended by WHO could have been easily evaluated for use in Bangladesh in a centralized reference laboratory, such as IEDCR, and then distributed to all other laboratories. There was also an opportunity for commercial development of home-grown RT-qPCR test kits for SARS-CoV-2 and any such initiatives should have been encouraged and supported by the government. During the past year, many test centers in Bangladesh suffered from the shortage of imported test kits. Turn-around time of tests sometimes exceeded more than 7 days because of a significant backlog in the testing process which also affected sample quality because of inappropriate storage. These could have been easily averted through smart process improvement and with proper utilization of locally available resources.

Apart from test capacity, maintaining test quality is crucial in managing a pandemic, because the consequences of false positive or false negative results could be devastating. A patient may be unnecessarily treated because of a false positive result. More importantly, in case of SARS-CoV-2, a patient with a false negative result may roam freely and spread the disease unknowingly. Incorrect test results and test result discrepancies between different laboratories were frequently reported in Bangladesh during the COVID-19 pandemic. It is true that pe-existing knowledge and experience on PCR or RT-qPCR based clinical tests for the detection of pathogens is very limited in Bangladesh. While technically these tests are not difficult to develop or implement, evaluating and maintaining the test quality is critical. In developed countries, especially in large hospitals or reference labs, regular PCR and RT-PCR-based tests are performed to detect pathogens. These labs usually follow the guidelines given by internationally recognized organizations such as the College of American Pathologists (CAP), the Joint Commission or the ISO for quality control of tests. Perhaps, it was not practically possible for the RT-PCR labs that were established overnight to fully comply with these guidelines in such a short period of time. But to the least, it was possible for the central public health laboratory to monitor the test performance by sending a panel of external quality assessment (EQA) specimens to the newly established laboratories at regular intervals.

Under normal circumstances, it is desirable to use the standard methods for clinical testing. But under emergency situations like COVID-19 pandemic, it is necessary to think out-of-the-box for the greater benefit of the population. This is particularly applicable to situations when the resource is limited, but the testing must be continued to control the pandemic. In response to COVID-19 pandemic, there was a massive surge in RT-qPCR testing worldwide, leading to a short supply of test reagents and components. Under such situations, modifying the standard protocol or the use of alternative test methods and technologies may be necessary. However, any change in the existing methods or the use of new methods must undergo a validation phase to ensure that test performance is not significantly impacted. In order to save scarce resources and to ramp up test capacity many such modifications were evaluated and have been published such as i) direct RT-qPCR on nasopharyngeal swab specimens or saliva without RNA extraction to save RNA extraction kits and reagents ii) decreasing the reaction volume to save RT-qPCR mastermixes and iii) pooled specimen testing in low prevalence setting. These modifications are now even recognized and approved by WHO and FDA for use in appropriate contexts.

Again, methods based on alternative amplification chemistry or alternative detection technology have also been proposed and evaluated. For example, a laboratory in the Department of Biochemistry and Molecular Biology in Dhaka University has attempted to evaluate an open source, reverse-transcription loop-mediated isothermal amplification (RT-LAMP), which looked very promising. RT-LAMP is an isothermal amplification method that does not require, expensive real-time PCR systems. The test can potentially be done directly on clinical specimens without RNA extraction, requires only a simple heating block for amplification and positive amplification can be detected visually through colorimetric detection. A properly designed and validated RT-LAMP assay could have been particularly useful in the context of Bangladesh for mass-scale testing in remote areas as a point-of-care or near point-of-care test. Unfortunately, the effort was not successful because of lack of support from the authorities to continue to the clinical validation

phase.

Apart from molecular tests, many antibody and antigen-based tests have also been developed worldwide over the year. It is unfortunate to witness that as yet now antibody tests have not been approved for use in Bangladesh. While antibody tests cannot replace RT-qPCR for the detection of the SARS-CoV-2 virus in patients with acute COVID-19, antibody tests have many other applications that can supplement the efforts to manage the pandemic. Antibody tests are useful to know whether someone had COVID-19 in the past. There are many patients in Bangladesh who did not go for COVID-19 RT-qPCR but had mild symptoms at some point and were wondering if they had COVID-19. Many such patients are likely immune to re-infection which could have been confirmed by antibody tests. Antibody tests are also important for seroprevalence studies and for convalescence plasma donor screening. In some severe patients, when the clinical suspicion is high, but RT-qPCR test results are negative, antibody tests can be helpful in diagnosing COVID-19. Early in pandemic, Gonoshasthya Kendra came up with the idea of developing a COVID-19 test kit based on antibody that drew widespread media attention. However, the effort initially lost its credibility because of misconception and lack of scientific data. At the same time, there was lack of government support, and ultimately when the test kit was evaluated, it had sub-optimal performance as an antibody test. Unfortunately, while the controversy kept going on, there were no initiative from the authorities to import antibody test kits that are of better quality and are approved for use in developed countries. As a result, Bangladesh missed a great opportunity to gain certain benefit from antibody tests.

Unlike antibody tests, clinically, antigen tests perform the same function as the RT-qPCR tests because both are capable of detecting the virus in nasopharyngeal swab specimens to diagnose the acute disease. Antigen tests have the advantage as a point-of-care (POC) test. Rapid antigen tests based on lateral flow immunochromatography are simple tests like pregnancy tests and can be performed in any setting. However, the reason antigen tests did not play significant role in managing COVID-19 pandemic is its poor sensitivity and because of the implications for a potential false negative results. Over time, the test quality improved and with the knowledge that patients with low SARS-CoV-2 viral load in nasopharyngeal specimens are less likely to transmit the disease to others, antigen tests have also found some applications in certain setting. Albeit delayed but the government of Bangladesh has eventually approved antigen tests in Bangladesh, and it is now offered in more than 100 facilities. This decision is justified given that RT-qPCR is yet beyond the reach of a greater proportion of the population. Antigen testing will at least help isolating patients with high viral load who are more likely to spread the disease to others. However, merely hundred test facilities are not enough for a population of 160 million. There are hundreds of thousands of diagnostic centers in Bangladesh which are not equipped to do RT-qPCR tests, but these facilities can easily offer antigen and antibody tests with some training.

It must be noted that no single diagnostic method is 100% perfect or are applicable to all situations. Therefore, it is important to assess the pros and cons of a method and apply them in appropriate context, and whenever necessary, apply a combination of approaches. It is also important to correctly interpret the results of a test based on the test principles, test method and the type of the specimen. Under the pandemic situation, the population benefit as opposed to individual patient benefit must be overweighed. COVID-19 pandemic has clearly showed us the deficiencies in infectious disease pandemic management in Bangladesh. It is not expected that everyone will know everything. But the designated institute IEDCR, which is the CDC equivalent in Bangladesh, must be the one capable of preparing, alerting, coordinating and leading all efforts related to laboratory testing .

During the COVID-19 pandemic, lack of support from and the knowledge and expertise of IEDCR in relation to laboratory testing and surveillance were particularly noticeable. With more than hundred RT-qPCR facilities, Bangladesh now has a great infrastructure for COVID-19 testing, which could be utilized as permanent molecular testing facilities for other infectious pathogens as well. However, these test facilities must be guided by a central reference laboratory to maintain the quality and standard of the tests. As the central reference laboratory, IEDCR must be equipped with all modern laboratory facilities and employed with laboratory scientists, Biochemists and Molecular Biologists and Microbiologists. If necessary, IEDCR scientists should be sent aboard for training on design, development and evaluation of tests and surveillance methods. With several COVID-19 vaccines in hand, we now have an extra and one of the most important tools in hand for pandemic management. However, vaccinating an entire nation is a daunting and time-consuming task. It is likely that the role of COVID-19 testing will remain as important as before for a long period of time. Therefore, Bangladesh must act now on the advancement of its local expertise and resources for a sustainable future.

The Microbiologists in the Pharmaceutical industries: roles and opportunities

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A fortunate accident in early 1900s that saw the discovery of penicillin taught us the method to kill infectious microbes using microbial products and became an epoch-making event in the field of clinical and pharmaceutical microbiology. In the decades past, microbiology was only considered as a study of microscopic living organisms namely bacteria and fungi, and microbiologists worked mainly in laboratory research settings. However, as the potential of microbes are being continuously uncovered, microbiologists now work on a variety of basic and applied research, ranging from public health and nutrition; medicine and agriculture; food safety and security; livestock and fisheries to pollution control in the environment and industries.

It is true that microbes were identified to be the causative agents of infectious diseases, however, the focus shifted to reveal their beneficial roles after the discovery of life-saving penicillin in 1928. The pharmaceutical microbiology has come a long since its inception in the last century. Now, the production of antibiotics, enzymes, vitamins, biologics, biosimilars, monoclonal antibodies, vaccines, and other pharmaceutical products is based entirely on microorganisms including bacteria and fungi. For example, the animal-sourced insulin (i.e. bovine insulin) was replaced with human insulin using a bacterium, Escherichia coli, as expression host, thanks to the advent of genetic engineering; the resulting recombinant product is easily absorbed in human system and significantly decreased insulin allergies caused by non-human origin.

Conventionally, the role of a microbiologist in a pharmaceutical industry is appreciated by their works ranging from culture preparation, propagation and preservation to ensuring safety and quality of the manufactured products, generally performed in the Quality Assurance (QA) and Quality Control (QC) division of the industry. Here, they ensure the microbiological quality of raw materials before they are processed in the production area, and test the ultimate finished products from microbiological perspective. These include tests on microbial limit, bioburden, sterility and bacterial endotoxin; enumerating biological indicators; and disinfection efficacy test and biological assay of drugs and vitamins before those are marketed. Importantly, the assay methods that will validate the quality of the products are standardized by microbiologists.

Heating, ventilation and air-conditioning (HVAC) play an important role in the working premises for manufacturing pharmaceutical products. Ensuring the microbiological quality of the working environment, i.e. the air quality and that of the water used for both sterile and nonsterile products comes as an automatic responsibility for the microbiologists. Therefore, s/he needs to offer the necessary protocols and techniques associated with the operation and assurance of clean room, aseptic room and controlled environments for preventing any possible microbial contamination, and introduces risk assessment and practical contamination control strategies (Figure 1). Quality management professionals oversee that all operational departments comply with the recommended best practices, e.g., good laboratory practices (GLP), good clinical practices (GCP), good manufacturing practices (GMP), good pharmacovigilance practices (GVP) and good distribution practices (GDP). Falling short to comply with any of this standard operating procedure (SOP) could make a life-saving drug to life threatening. The QA and QC departments therefore are pivotal parts of a pharma-industry.

Figure 1: Quality management overseen by microbiologists in a pharma industry

Ideally, the potential of microbiologists can be well appreciated in the Research and Development (R&D) wing of the industry. They have been playing pivotal roles in discovery and development of various types of drugs and pharmaceutical products since the inception of antibiotic era. The development of antibiotics and vaccines are regarded as the most notable accomplishment of microbiology in the history of medicine. Antibiotics are byproducts of microbial metabolism, which are used to cure bacterial infection; 12 classes of antibiotics had been discovered from microbial origin in last 90 years. The development of antimicrobial resistance (AMR) by microorganisms, however, often plagued the public health at bay; therefore, urge for making the newer antibiotics had been a dire need of all times (Figure 2). If not successful, the human civilization will be on the verge to embrace the pre-antibiotic era, and that could be dreadful!

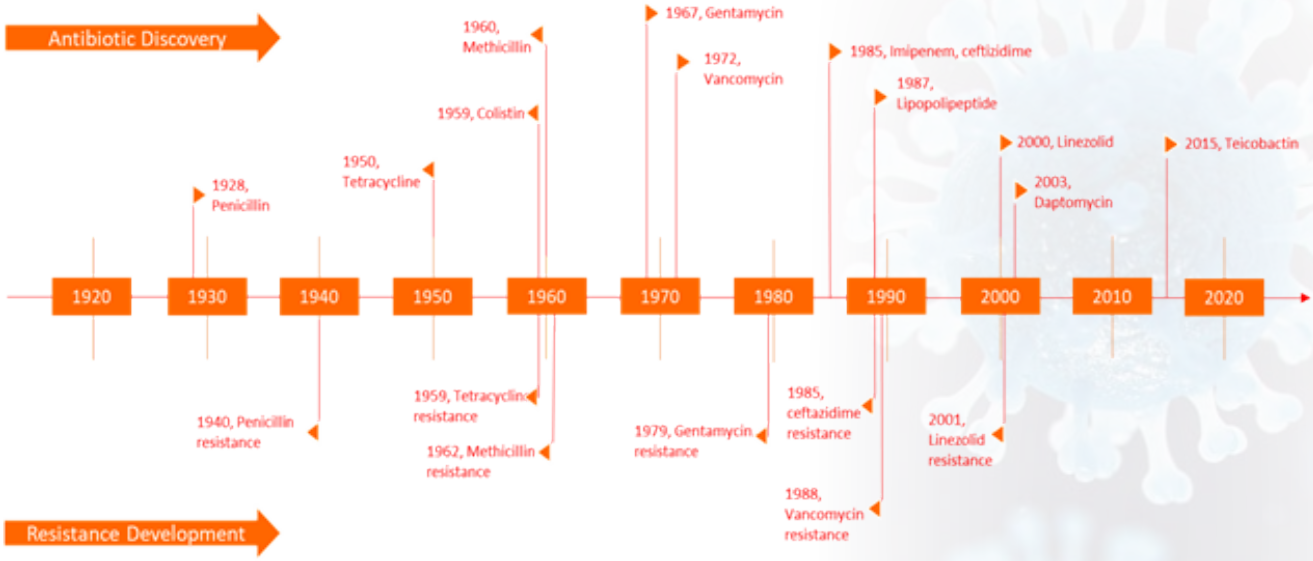

Figure 2: Timeline of newer antibiotic discovery following development of drug resistance

Microbiologists found a ray hope in developing anti-microbial peptides (AMP) to counter AMR by exploring the pristine world of previously unculturable bacteria in 2015 using high throughput techniques. Likewise, they have paramount influence in designing and developing vaccines, thanks to their lessons of bioinformatics, immunology and bioprocess technology. Identification of an antigenic part in an infectious agent, and its propagation during vaccine production requires technical skill of microbiologists. In recent times, peptide-based drugs such as anti-cancer peptides and antimicrobial peptides from microbial origin are showing promises. Using the tools of bioinformatics, microbiologists are designing these peptide-based compounds, engineered by incorporating useful fusions to enhance their activity where applicable. Apart from drugs, microorganisms can also be tailored to produce amino acids, vitamins, nucleotides and some of the important pharma product as primary

metabolites. Therefore, the engagement of microbiologists, in the R&D section could open up windows of vital opportunities.

In Bangladesh, the pharmaceutical industry is one of the most developed technology sectors. This sector has been transforming and evolving since the early 80s when the pharmaceutical market was dominated by the multi-national companies, fulfilling 70% demand of the then drug market. Today, the sector manufactures more than 450 generic drugs, providing about 97% of the total medicinal requirement of the local market. According to IQVIA, a US-based pharma consultant, by the end of September 2019, the total pharmaceutical market stood at around BDT 250 billion (USD 3 billion). This is forecasted to surpass $6 billion by 2025 with a growth of 114 percent from its 2019 level, according to a report from a Dublin-based market insight and analysis firm, Research and Markets (Figure 3).

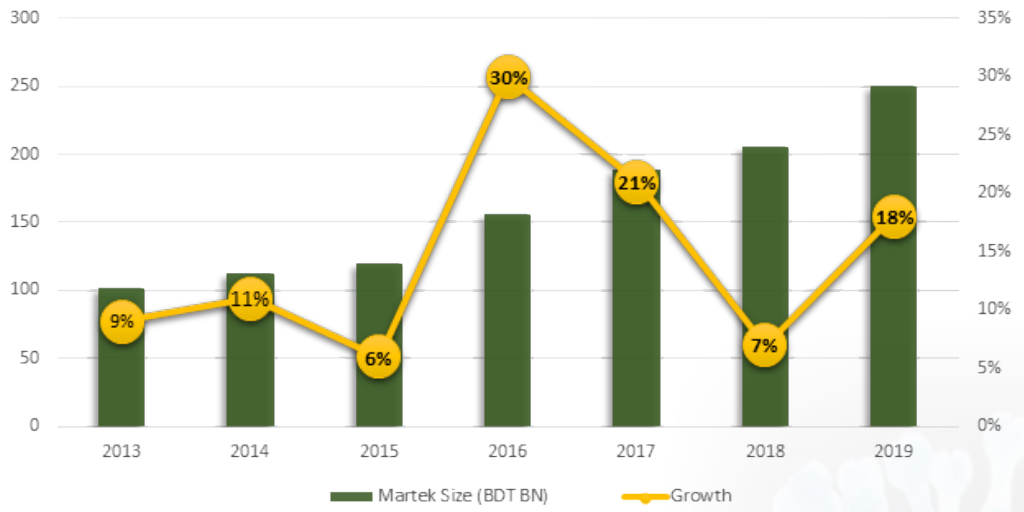

Figure 3: Pharmaceutical industry size of Bangladesh (Source IQVIA and EBLSL)

Pharmaceutical industry is the largest white-collar labor-intensive employment sector that employs skilled work force. Drug development and production is highly dependent on the interplay between different scientific and other disciplines. In practice, it includes intensive collaboration amongst pharmacologists, pharmacometricians, toxicologists, pharmacokinetics, biopharmacy and pharmaceutical technology experts, different types of biologists, such as molecular biologists, biochemists, biotechnologists and microbiologist, chemists as well as representatives of other disciplines, such as, bio-engineers, data analysts, intellectual property (IP) specialists and patent lawyers. Microbiologists in Bangladesh can find this sector as one of the top career choices, although there are rooms of improvement to make it 'attractive' in the market. Currently at entry point, they are recruited as a junior or an assistant, preceding their functional job title, for example, assistant project manager, quality control officer, microbiologist. After a year or two, these prefixes can be dropped and after an additional number of years of experience in the same job, the prefix is replaced with 'Senior', for example, Senior Project Manager, Senior quality control officer etc. A career path for microbiologists ascending to the top management in the industry could be lucrative for young professionals. In addition to the management responsibility, the research skill of microbiologists is yet to be widely appreciated here in Bangladesh, what could be utilized in the R&D department. Given the pandemic nature of the pathogenic microorganisms and its containment, it is high time that the industry invests on microbiologists who could offer a fair share to design vaccines and antidotes, and its manufacturing in the appropriate plants. Their useful recruitment can offer a win-win situation in the industry promoting welfare for the public health and the state.

Acknowledgement: We thank Mr. Nawabur Rahman, Director, Technical Operations, Square Pharmaceuticals Limited for his important opinion.

Digital Marketing Challenges in the Pharmaceutical Industry of Bangladesh

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The pharmaceutical marketing in Bangladesh is in a transitional phase. At present traditional marketing and digital marketing is being practiced side by side. It is like hybrid marketing. Some of the sales and marketing activity is digital and some traditional.

The industry is slow to innovate its marketing, certainly with digital. Marketers are put into the limelight, more so than salespeople.

Although this industry is highly dependent on the sales forces for direct contacts with the doctors. In the present scenario the sales people have to at least 20/30 doctors per day whereas they are hardly given time by the doctors to promote their products. Conversely the sales people have hardly anything new to offer to the doctors with the "ME TOO" products. Companies recruiting qualified work force are doing better in the industry. Before discussing digital marketing challenges, there are other being faced by the industry such as, supply chain disruption, collection and analysis of huge amount of data specially on the prescription patterns of the doctors.

Optimization of the work of sales forces etc.

Sales forces' main job is to create and optimize meaningful one-to-one communications with the doctors and pharmacies.

To give more time to the doctors' front sales people in some companies specially the big players have provided the sales forces with the order taking aps through which they can capture orders and send them back to the head office /depots.

This is just one of the many e-platforms of the digital marketing. Yet some companies have adopted digital channels but could not make a positive effect on their customers specially doctors. The doctors became overwhelmed with the digital choices. They are now bombarded with tons of daily emails, messages, calls, invitations to webinars, and virtual conferences. The COVID-19 has forced the companies to go for such virtual conferences and webinars.

Going digital now is no more an option to those in pharma marketing but has become the only means to meet their marketing and business objectives.

Having said this, the major changes that have come in the pharmaceutical industry have been both challenging and a learning experience – as pharma marketers continue to adapt and improve upon their marketing strategies to make the most of the available digital options.

Marketing budgets had to be revised, brand plans had to be reworked, focus products had to be amended as per the new market requirements.

In the background of all these issues in pharma marketing, one major question that every pharma marketer was struggling with was –what was the best way to get in touch with doctors?

Let us take a close look at the present state of marketing in the pharmaceutical industry – That is, the issues relating to the pharmaceutical marketer's journey to digital transformation in 2020.

COVID-19 has transformed pharmaceutical marketing forever. At once the pharmaceutical marketing landscape got divided into "the traditional" (pre-COVID-19) and "the digital" (post-COVID-19) way of marketing.

Pharmaceutical marketers continued to follow their traditional marketing practices even in the new digital environment. For instance, the print collaterals were converted to pdf formats that were used as digital materials for engaging with their doctors. Adopting a Digital Mindset is the key to a successful Digital Transformation. The marketers need to separate itself from the conventional way of marketing of being highly product-centric and learn that Digital is all about the customers. Developing a digital mindset has become the need of the hour for pharmaceutical marketers to win in the digital world.

Bearing in mind, digital has opened new opportunities to be creative in engaging and

reaching out to customers.

Pre Covid-19 and post Covid-19 differentiation has always been a challenge for the industry, and the fight has become even more competitive in the digital domain.

As social distancing measures canceled face-to-face physician engagement it is evident that the digital alternatives are not yet up to par.

Giving this scenario, the next challenge for pharma marketers is to make strategic choices of the available digital tools and channels to create more meaningful interactions with their customers.

So instead of being present in all the channels, pharma needs to make thoughtful decisions based on analytics and a more clear understanding of their customer needs and journey map.

Another digital marketing challenge is managing customer relationships in the digital environment.

Maintaining regular doctor visits and building relationships was a key part of the sales team. But as contacts with doctors reduced during COVID-19 – the key component to driving pharma sales got impacted in a big way. Doctors are also not too keen on physically meeting the reps in their clinics for a pretty long time.

Pharmaceutical marketing needs to give critical thought to maintaining human connections even in the virtual engagement model. That is by creating digital experiences that matter and that would help strengthen their customer relationships instead of weakening them. In the digital environment, the morale of the sales force is down. Everything that the sales function was responsible for – that is to drive prescriptions, promote brand awareness, and to develop new customers, is no more applicable in the new environment.

The big question now is:

How can sales perform in the COVID-19 given circumstances and what will they be accountable for?

The face of the rep is kind of changing. Interacting and conducting meetings with doctors virtually will surely require different skill-sets.

Marketers need to look into the current challenges in remote detailing. How can they support their reps with digital tools to make effective doctor interactions? The role of medical services department and product management department in some companies have become vital to support the sales reps with the digital tools. Stepping into this new era of digital marketing will require new metrics to gauge the field forces' daily working- that means moving away from the traditional method of call reporting formats to the newer lead metrics like the number of video engagements, etc. But it appears that the combination of digital and traditional marketing has made it a little clumsy about the role of the sales function.

The Bangladesh Pharma marketers, in many cases lack practical digital marketing skills. Digital marketing has new marketing jargon, metrics, marketing mix, and channels that need to be learned. Marketers who are still in the very early stages of their learning curve can find digital marketing to be quite complex to understand and implement.

What is lacking today, are marketing professionals with experience in digital marketing to make good strategic decisions for their brands.

The pharmaceutical industry is still very dependent on their external digital marketing agencies to guide them through the various digital options. The industry needs marketers with the

The knowledge in digital marketing is now the need. But it will take an in-depth study of the individual topics in digital marketing to be able to create result-oriented strategies.

And real learning can come, only through practical hands-on experience with various digital tools.

Being one of the most highly-regulated industries, pharma will always have to maintain the highest ethical standards in all its communications. In a way, the high regulatory policies and legal requirements have hindered pharma's ability to get creative and communicate with their customers. This is another challenge of the industry. The regulatory challenges in the pharmaceutical industry have surely limited the ability to fully explore the newer digital channels. But it is also a well-known fact, that today pharma cannot shy away from social media.

Even with all the regulatory concerns, pharma needs to educate themselves with the policies and make the most of the digital media to their advantage.

Pharma needs to wake up to the opportunity provided by social channels to educate and inform its audience and build a brand following.

Bringing in a customer-centric organization model

It is often seen that a single pharmaceutical company will have different group of representatives to promote different brands from the same company like cardiac drugs, drugs for pulmonary diseases, drugs for gastrointestinal disorders, nervous disorders and so on.

So a doctor would be visited by multiple reps from the same company for that drug molecule – promoting different brand names or even targeting different indications.

All these were marketing tactics to get the most share of the doctors' prescriptions.

Today much is being discussed on the importance of

moving from the product-centric to the customer-centric based approach in marketing. All this becomes futile if the organizational structure at a higher level is not aligned to the customer-centric culture. At a time when the pharma reps are virtually interacting with their doctors, marketers need to be thoughtful about every interaction. Marketers need to make a strategic choice on the products that are being promoted to its customer.

During COVID-19 there has been an overload of information, which was not quite relevant to the doctors.

Customers' expectations have risen in the digital medium.

They expect content to be highly personalized to their specialty. They have also shown preferences on their choice of format and channels for delivering this content.

To provide some outstanding customer experiences, marketers will have to integrate their offline and online communications more seamlessly.

This means measuring and analyzing the performance from one channel to customize the customer responses through intelligent use of analytics and measured insights.

Pharma marketers need to invest in Content Marketing

Content marketing is something that pharma marketers need to take seriously. Marketers need to think beyond their brand and offer rich content experiences, which are crisp, to the point, and engaging. There is much value in providing the right content, to the right customers, and through the right channels.

And it is not only about creating content in volumes – the pharma marketers need to spend much of their time in research to understand their customer needs at the different stages of their journey. And then chalk down a well- defined content strategy.

So, the key is to first have a Content Strategy in place –

that will solve the customer's queries or problems at every step of their journey and then work towards providing compelling content, consistently.

Doctors have not been quite happy with the information provided by some pharmaceutical companies during the COVID-19 pandemic.

They have been quite clear on their demand for quick and crisp information that can be readily available at the tip of their fingers – and that which is customized to their requirements.

So yes, pharmaceutical marketers will need to speed up their lengthy approval processes to be able to respond rapidly to the current market needs appropriately.

Companies would surely not want to miss the opportunity to be the first ones to serve their customers' informational and educational needs. For this to happen one will need agile marketing which involves short-term planning and speedy execution cycles.

In the marketing context, it means using data and analytics to continuously guide promising opportunities or solutions to problems in real-time, deploying tests quickly, evaluating the results, and rapidly iterating.

In the pre Covid-19 traditional marketing there was no patient engagement strategies but COVID-19 has greatly impacted patient's treatment. Patients are scared to visit their doctor's office, many have cancelled their appointments, while some have considered to virtually interact with their physicians.

Patients were scared to visit doctors chamber but comfortable to go to their local pharmacy.

All this has raised concerns on patient adherence to their ongoing treatment and meeting their overall health goals.

There is surely a huge opportunity for successful patient engagement support programs from pharmaceutical companies now, more than ever.

Pharma needs to step in as a trusted partner to support the palli chikitshoks and village doctors, to better treat their patients in the remote setting, to help keep track of the patient's therapies, and to manage their conditions during COVID-19. Also educating the village doctors on disease, dosage and treatment plans.

These strategies will help the companies to stand out in the competition with the transformation of digital marketing.

Even with all the regulatory concerns, pharma needs to educate themselves with the policies and make the most of the digital media to their advantage. Pharma needs to wake up to the opportunity provided by social channels to educate and inform its audience and build a brand following.

It is often seen that a single pharmaceutical company will have a drug under different brand names each marketed by the different marketing divisions of the company.

So, a doctor would be visited by multiple reps from the same company for that drug molecule – promoting different brand names or even targeting

different indications.
All these are marketing tactics to get the most share of the doctors' prescriptions. But today much is being discussed on the importance of moving from the product-centric to the customer-centric based approach in marketing.

All this becomes futile if the organizational structure at a higher level is not aligned to the customer-centric culture.

At a time when the pharma reps are virtually interacting with their doctors, marketers need to be thoughtful about every interaction. Marketers needs to make a strategic choice on the products that are being promoted to its customer.

During COVID-19 there has been an overload of information, which was not quite relevant to the doctors. Customers' expectations have risen in the digital medium.

They expect content to be highly personalized to their specialty. They have also shown preferences on their choice of format and channels for delivering this content.

To provide some outstanding customer experiences, pharma will have to integrate their offline and online communications more seamlessly.

This means measuring and analyzing the performance from one channel to customize the customer responses through intelligent use of analytics and measured insights.

Pharma marketers need to invest in Content Marketing Content marketing is something that pharma marketers need to take seriously. Marketers need to think beyond their brand and offer rich content experiences, which are crisp, to the point, and engaging. There is much value in providing the right content, to the right customers, and through the right channels.

And it is not only about creating content in volumes – the pharma marketers need to spend much of their time in research to understand their customer needs at the different stages of their journey. And then chalk down a well- defined content strategy.

So the key is to first have a Content Strategy in place –that will solve the customer's queries or problems at every step of their journey. And then work towards providing compelling content, consistently.

We all know the lengthy pharma regulatory and legal compliances that every content/campaign/message needs to go through. But it is Speed that will drive the success of the pharma's digital transformation. We also know that doctors have not been quite happy with the information provided by pharma during the COVID-19 pandemic.
They have been quite clear on their demand for quick and crisp information that can be readily available at the tip of their fingers – and that which is customized to their requirements.
So yes, pharma marketers will need to speed up their lengthy approval processes to be able to respond rapidly to the current market needs appropriately.
No company would surely want to miss the opportunity to be the first ones to serve their customers' informational and educational needs. Agile marketing involves short-term planning and speedy execution cycles.

In the marketing context, it means using data and analytics to continuously guide promising opportunities or solutions to problems in real-time, deploying tests quickly, evaluating the results, and rapidly iterating.

Successful patient engagement strategies to improve health outcomes

COVID-19 has greatly impacted patient's treatment. Patients are scared to visit the doctor's chamber, many have cancelled their appointments, while some have considered to virtually interact with their physicians but they are comfortable to go to their local pharmacy or village doctors.
All this has raised concerns on patient adherence to their ongoing treatment and meeting their overall health goals.

Pharma needs to step in as a trusted partner to support the village doctors, to better treat their patients in the remote setting, to help keep track of the patient's therapies, and to manage their conditions during COVID-19.

Companies can come forward to educating the Village doctors patients on the disease, dosage and treatment plans.

Prospects and Challenges of API Industry in Bangladesh

Dr. Md. Rabiul Islam
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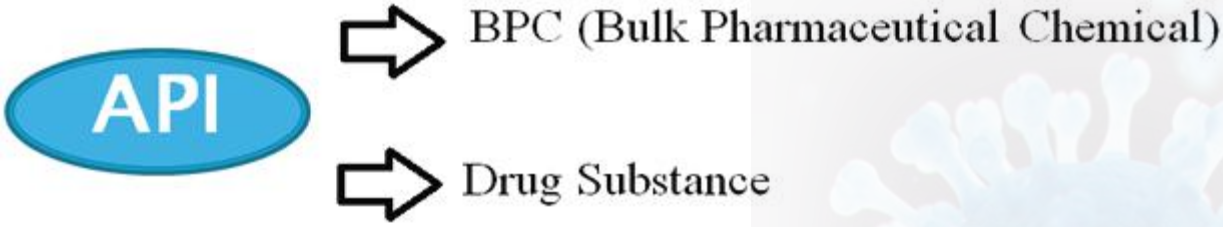
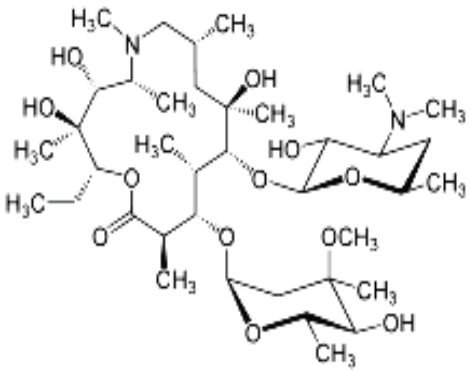
Introduction

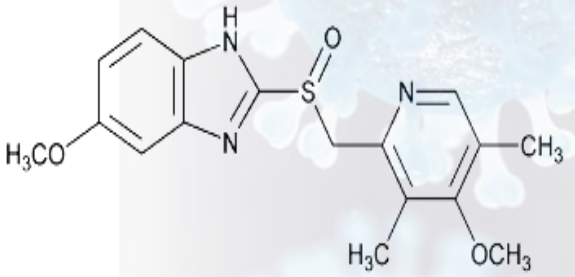
An Active Pharmaceutical Ingredient (API) is defined in ICH Q7 as "any substance or mixture of substances intended to be used in the manufacture of a drug product and that, when used in the production of a drug, becomes an active ingredient in the drug product. Such substances are intended to furnish pharmaceutical activity or other direct effect in the diagnosis, cure, mitigation, treatment or prevention of disease or to affect the structure and function of the body."



Some examples of API are given below:



Azithromycin (macrolide antibiotic)



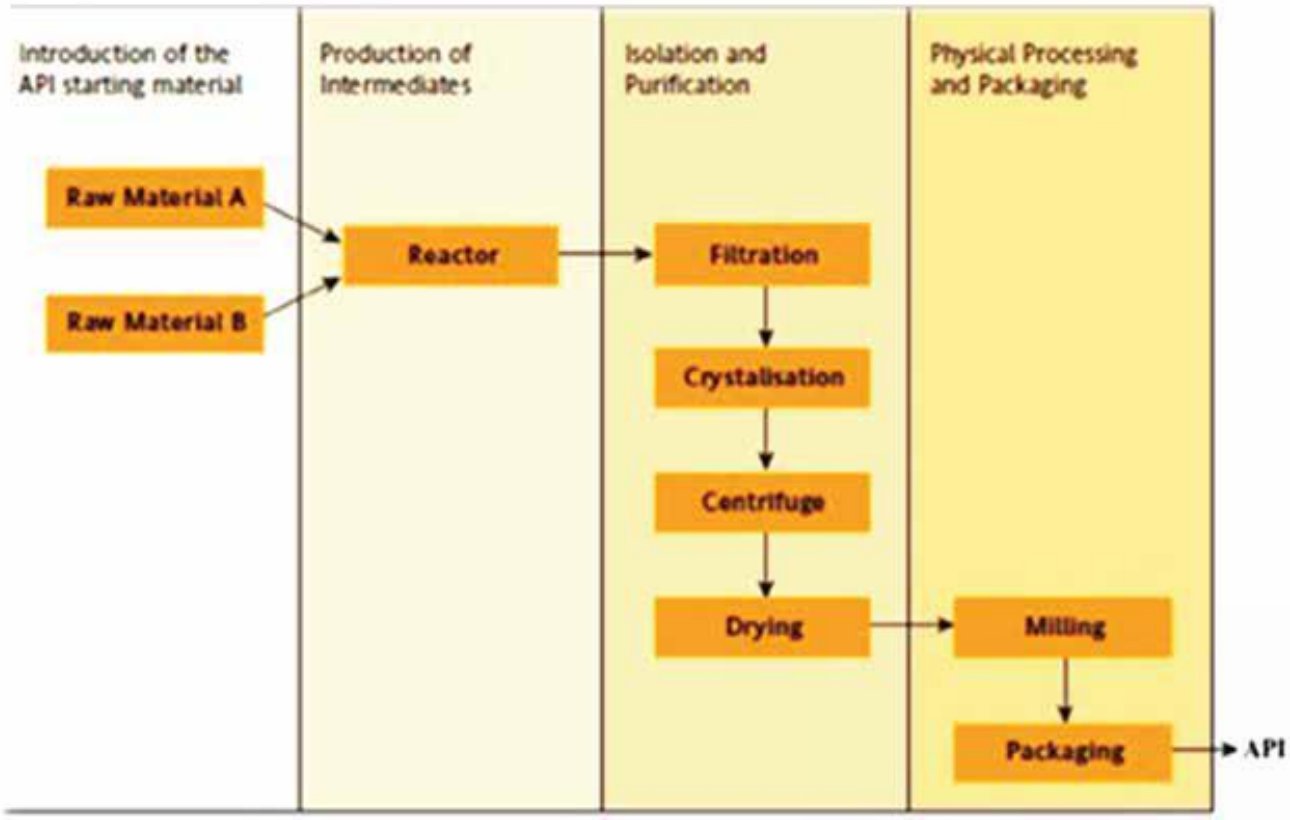
Esomeprazole (antiulcerant)

Sources of API

The important sources of API include: 1) Chemical synthesis 2) Isolation from natural sources 3) Biotechnology 4) Fermentation process 5) Recombinant DNA and the combination of these processes.

The important source of API is definitely chemical synthesis. Synthesis means a combination of two or more entities that together form something new i.e. creating something by artificial means.

API MANUFACTURING BY CHEMICAL PROCESS INVOLVES FEW STEPS WHICH ARE SHOWN BELOW:



Challenges of API Manufacturing

API synthesis is not like an ordinary organic synthesis. It differs in many respects. **An ideal API synthesis includes:**

- Pure raw material from different sources:
- Selection of synthetic route
- Green chemistry
- QC approval according to USP/BP
- API manufacturing must follow cGMP regulation

- **Production Cost:** It depends upon import of raw material from China and India. Usually, price of raw materials increases and price of finished API decreases from abroad. In practice, we carry out secondary and tertiary steps to reduce the cost. To do these effectively, infrastructure for primary step must be established in the country.
- To get a pure API molecule, innovative and skilled chemists are needed.
- To get skilled manpower, pay structure should be attractive and collaborative researches between universities and industries should be established.
- R&D department with sufficient modern facilities must be present. Additionally, online reaction monitoring facilities should be made available.

Challenges in case of not having API production

- Prices of imported API may increase at times.
- Availability of required API might not be possible.
- Quality of imported API may vary time to time.
- Difficult to compete in international market to export finished Pharmaceuticals products with imported API.

Prospects

The pharmaceutical sector is one of the most developed technology-led sectors among the manufacturing industries in Bangladesh. Bangladesh is an immerging generic drug hub in Asia. There are about 250 pharma industry in the country.

Trade-Related Aspects of Intellectual Property Rights (Trips) trea

- Bangladesh being a LDC country can produce Patents API and make sale to Local and Export market.

▶National Active Pharmaceutical Ingredients (API) and Laboratory Reagents Production and Export Policy 2018

■ **Corporate Tax Holiday**
100% corporate tax holiday to API and Laboratory Reagents Manufacturer till FY2021-22 and under some conditions the tax holiday will be provided till 2032.

■ **VAT Exemption**
VAT and VDS exemption facility to API and Laboratory Reagents Manufacturer in purchase and sale of products, raw materials and equipment till 2032.

■ **Cash Incentives**
20% cash incentives for export of API and Laboratory Reagents.

■ **Policy Incentives regarding Foreign Currency**
Permissible delay of Import Payment of raw materials extended from 180 day to 360 days .

▶ API Park

An API industrial park of 200 acres land at Munshiganj (37 kilometers from Dhaka) is being set up to achieve self-sufficiency to gain competitive advantages in global market. But API Technology Park is delayed due to many factors. E.g. Infrastructure and land development, cost, gas connection, electricity supply etc. Local companies have already lined up with some USD 300 million for investment for setting up facilities. Government is also inviting foreign companies/NRBs to invest in this "API Park".

▶ **Export scenario**

- Currently formulated drugs are exported to **150 countries** around the world, the growth rate is about 10%.
- In 2018, pharmaceuticals export was over 130 million USD whereas the world market is USD 1.2 trillion.
- In FY 2017-18 manufacturers are meeting **98% local demands** of Bangladesh.
- The **local manufacturers capture 90% market share** and the rest by the MNCs (Sanofi, Novo Nordisk, Novartis etc)

API Scenario
API is the core component of finished drug, the primary cost component for production.

- Bangladesh has to **import 95-97% of the raw material from 98 indenters around the world,** especially from **China, India, Korea and Italy.** Each year we import APIs of approximately USD 600 million. This generates higher cost factors up to 30 to 40% of the total cost.
- **Only 41 APIs are produced locally by 8 companies supplying 3-4% of the total demand.** The local API manufacturers are Active Fine Chemicals Ltd. (AFCL), Square Pharmaceuticals Ltd., Beximco Pharmaceuticals Ltd., Gonoshasthaya Pharmaceuticals Ltd., Globe Pharmaceuticals Ltd., Renata Pharmaceutials Ltd., Nip Pharmaceutials Ltd., Incepta Pharmaceuticals Ltd. Among them **only AFCL sell APIs locally** and export to Pakistan, Egypt, Vietnam and Nepal.

At A Glance

- Domestic market size Tk. 20,512 crore
- Annual growth 10%.
- Local companies hold 90% market share.
- Multinationals hold 10% share.
- 98% demand met locally, 2% with imports.
- Contributions to GDP 1.83%.
- 80% makers produce genetic drug.
- 20% manufactures produce patented drugs.
- Bangladesh exports to 150 countries of total export USD 130 million. It could cross billion dollars in next 5 years.

Conclusions

- Bangladesh needs to develop its API production capability.
- Need to invest in R&D (Reverse Engineering).
- Need to work in process/technology development.
- Attract scientist (Chemist, Pharmacist, Biochemist, Chemical Engineers and relevant professionals) to the API industry.
- Find/attract suitable partner from abroad for joint collaboration for technology and market access.
- Strengthen collaboration between industries and academic institutions (University) through UGC for developing skilled manpower.
- Involve BCSIR to take up API R&D as priority sector.
- Need incentives and support from the Government of Bangladesh in all aspects of API production.

Bangladesh Pharmaceutical Sector: Radical Amendments of the Drug Act is required for Basic Development and Modernization of the Industry

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Introduction

The pharmaceutical industry in Bangladesh is one of the most developed technology sectors within the country. Manufacturers even produce insulins, hormones, and cancer drugs in business collaboration with the Multi-National Pharmaceutical Companies (MNCs). This sector provides 97% of the total medicinal requirement of the local market. The industry also exports medicines to global markets, including Europe. While Pharmaceutical companies are expanding their business with the aim to increase their reach in the global market, they are ignoring an important fact, they do not have the ability to manufacture APIs. So, what do we mean by manufacturing of APIs? To put it simply: Pharmaceutical manufacturing has two technologically distinct components: (i) manufacturing of Active Pharmaceutical Ingredients(APIs) and (ii) formulations manufacturing, i.e., processing of APIs into finished dosage forms such as tablets and injections. Bangladesh initially focused on formulations manufacturing and only lately has started taking steps to diversify into API. This has been an important difference with India as the major weakness of the industry in Bangladesh. This has implications for the international role that Bangladesh can play as an LDC supplying patented medicines to the world.

Most developing countries in the world face huge difficulties to manufacture and promote their local pharmaceutical products. As mentioned earlier, Bangladesh is an exception. Since 1982, the country has succeeded in developing the pharmaceutical industry sector. This rise has been credited to the drug ordinance of 1982 which received immediate recognition for its radical objectives. While this was a great achievement, the development of the API sector was neglected in 1982 and the negligence is persisting till date. This did not primarily pose a problem as cheap API supplies could easily be imported from China and India. Also the pharmaceutical sector was still in its preliminary phase. But as the sector has developed, the lack of a functioning (API) production sector is now causing problems in further advancement of the pharmaceutical sector as a whole.

What is TRIPS and how it affects the World

On 23 January 2017 World Trade Organization (WTO) enacted an amendment to Trade-Related Aspects of Intellectual Property Rights (TRIPS). TRIPS was originally negotiated by WTO between 1989 to 1990. It set the minimum standard for regulation by national governments of different forms of intellectual property. It came into effect in 1995. Unlike Bangladesh, India and China recognized product patents production. So now, in the TRIPS era, they cannot officially sell or manufacture APIs related to patents except under circumstances consistent with the TRIPS agreement.

Lack of MCN interest

Multi-National Companies (MCN), were primarily involved in marketing of non-essential drugs. But restrictions imposed in 1982 meant that contract manufacturing could not be done for essential drugs as well. The local companies also did not have the capabilities to produce the drugs at the time. Attempts were made to rectify the situation in 2005 and 2016. The restrictions were lifted and new laws were passed encouraging MCNs to be

more directly involved in manufacture and technology development and transfer. But generally MCNs are finding it difficult to compete with local companies. They are also finding it difficult to partner with local companies and manufacture products locally as the restrictive nature of local firms and their preference in using only pharmacology graduates have left them with a shortage of expertise needed to manufacture these medicine. Overall, while MCN investment in the country is not discouraged no tangible steps have been taken to induce or compel them to invest either. Also biased nature of local firms has left them under prepared to deal with the expertise demands made by the MCN.

Pharmaceutical Product Patent Protection Abolition

Bangladesh like India and Pakistan inherited the British Patents and Designs Act, 1911, which recognized product patent production including in pharmaceuticals. India replaced this in 1970 with the Patents Act which came into effect in 1972 and abolished patents in pharmaceuticals. Bangladesh had the option to abolish patents before 1995, the year in which TRIPS went into effect. Even after this Bangladesh still could have abolished patents as the country was considered a Least Developed Country (LDC). The country chose to do it in 2008. They introduced to the market many patented products at very low prices. However, the full benefits of this law have not been realized because the APIs needed to make many patented medicine cannot be imported from the traditional sources, i.e., India and China, as international law prevents them from officially exporting patented APIs. Because of the weakness of the API production sector Bangladesh has not been able to play a major role like India as an LDC supplying patented medicines to the world. The abolition of patents has been extended to 2033. But if Bangladesh loses its status as an LDC before 2033 it will be required to introduce patent protection.

The Problems Associated with Importing APIs

So, how does Bangladesh import patented APIs without violating TRIPS? At present because of the abolition of patents, Bangladesh is not required to check if imported APIs meet TRIPS requirements. But other countries are not allowed to sell patented APIs. There are some official channels allowing import. Article 30 in TRIPS also allows for some limited exceptions. Article 27 also allows for some flexibility in interpretations allowing different countries to have different standards of patentability. Another important method is to import APIs in their penultimate stages and complete the last few steps within the country. But even this requires proper plants and technical skills which the country does not have at this moment. Another problem with getting APIs from imports is that when foreign suppliers realize that Bangladesh is dependent on them for supplies they can charge high prices. If we develop the industry to produce APIs within the country, the cost of production for many medicines can be reduced as we will not have to depend solely on the foreign suppliers.The expert committee of 1982 realized the importance of the API sector and recommended the abolition of the product patent and the development of the API sector. But the ordinance did not deal with this part of the recommendations as the government was targeting the formulation sector. As a result the creation of the API industry was neglected and the role of formulation based pharmaceuticals sector resembles the activities like garments sector of Bangladesh.

The Multidisciplinary Nature of Medicine Manufacture and Biased Nature of this Sector

Medicine manufacture is multidisciplinary in nature. Keen involvement of the major basic disciplines like Chemistry, Biochemistry, Applied Chemistry, Microbiology, Biotechnology & Genetic Engineering, Chemical Engineering etc. are needed for the proper growth and development of this sophisticated industry. But Clause 13 which was inserted into the 1982 ordinance gave pharmacists the responsibility of both manufacture and quality assurance of the products. As a result, formulation based activities were prioritized over the production of active pharmaceutical ingredients (API) as well as other relevant new technology development activities. Further amendments to the 1982 drug policy enacted in 2008 and 2016 still did not incorporate the other major basic disciplines for basic industrial development.

At present, health care systems around the world are undergoing changes as new techniques are being introduced. The use of blockbuster drugs to treat large populations will likely decrease and medicine will probably become hyper tailored

towards curing and preventing the disease rather than just treating the symptoms. We humans are constantly coming into contact with new germs and diseases. To meet these challenges new biosimilar products such as blood and blood components, allergenics, somatic cells, gene therapy, tissues, recombinant therapeutic proteins, vaccines, interferons and insulin etc. are constantly being developed and their quality is being researched. To achieve advancement in research not just pharmacists but people from all the major basic disciplines like need to work together.

The laws thus far have heavily favored pharmacists as the Government of Bangladesh has been actively trying to advance the sector by only using pharmacy graduates. For example: In the recently proposed Medicines Act-2021, laws have been suggested which can stop qualified personnel from getting jobs at certain posts and advancing their careers in the pharmacy sector. This will cause many new graduates to lose interest in the sector and to seek employment elsewhere. The giant local pharmaceutical companies have also shown a lack of interest in doing research. Rather, they have preferred the quick profits from selling the imported products as opposed to the short term loss and long term gains of research and development.Because of the lack of opportunity, many intelligent students and professionals are leaving the country and helping flourishing other countries. So if immediate action is not taken, this sector will continue to be restrictive and regressive. While the pharmaceutical sector around the world will continue to move forward, these partisan laws will cause the country to go backward.

There is also serious disconnect between the academia and the pharmaceuticalindustries in Bangladesh. This may be due to the costs and risks associated with drug discovery. Pharmaceutical companies do not want to involve themselves with universities and research institutions because of this cost and this has led to the laboratories at universities being woefully underfunded. So students are not able to receive education at the levels that they need. They are thus not properly prepared to handle the laboratory and research work that comes with the pharma sector. If the Government of Bangladesh (GoB) plans the sector is to improve this gap between academia and industry needs to be addressed and bridged.

Benefits of having an Inclusive sector and improving API manufacture

There are many benefits to improving the API sector and making an inclusive pharmaceutical sector. We can take the AIDS pandemic as an example. During the AIDS pandemic, the world benefitted from India not having a product patent protection in pharmaceuticals. After India started supplying the world with patented effective AIDS drug combinations, the price of the AIDs drugs combinations fell and there was a significant increase in treatment. India became the dominant source of AIDS drugs. They were able to do this because they had succeeded in developing the industry from the very basic stages. Since 1970, India stressed the development of the industry from basic stages. Local firms in India then were not in a position to undertake API production on any significant scale and stressed the importance of technology transfer through foreign companies. But foreign companies were not keen to invest for manufacturing APIs due to intervention by the government in India to develop the industry. The foundations for technological development and the growth of the API sector were laid by the setting up of large public sector manufacturing plants and a number of government research and development(R&D) laboratories under the Council of Scientific and Industrial Research (CSIR). The result was that when product patent protection in pharmaceuticals was abolished in India in the early 1970s, the Indian firms were technologically ready to take advantage of the opportunities. As a result, they were able to supply both APIs and manufactured drugs in large volumes across the world. During the Covid-19 pandemic,had the Bangladesh pharmaceutical sector been more developed, inclusive and open to doing research then the country could have played an active role in making its own vaccines, medicines and other essential drugs. But because many parts in the sector are so underdeveloped, the country has had to depend on handouts from the International community.

Recent steps taken to improve API manufacture

Since 2008, some steps have been taken to start the API industry. The GoB has declared its intentions to decrease the countries dependence on imported raw materials. The year, 2008, was

also the year in which the government approved the creation of the API Park. While work did begin in the same year, the process of handover has been considerably delayed. Quite some time will still be needed for the park to become fully operational. They have also pledged to take other steps like: 100% tax holiday for all API manufacturers for the first five years, providing 20% tax incentives for export of APIs, priority in getting land in industrial estates and economic zones, etc. But these steps alone provided by the GoB are not enough. Although the jobs at the pharma industry is multidisciplinary in nature, but the laws still heavily favors only pharmacists working in the sector. This has led to people from the other major basic disciplines not wanting to take jobs in the pharmaceuticals sector. So there happened stagnation in the research and development in this industry. New amendments need to be introduced which help in improving the working conditions of people from the other major disciplines. In addition, the major local companies need to be incentivized to show more interest in research. Professionals from the other major disciplines need to be given equal opportunity and also need to be encouraged to join this sector.

Conclusion

Finally, if Bangladesh wants to take full advantage of the absence of pharmaceutical product patents, it is important for the GoB to be directly involved in developing the technological base of the industry. The government can and should play an active role in re-organizing the R&D infrastructure in the country and also be directly involved in funding pharmaceutical R&D not only in government laboratories but also in pharmaceutical firms and universities and other R&D organizations. Simultaneously, like Indian CSIR, Bangladesh Council of Scientific and Industrial Research (BCSIR) will have to come forward with other institutions like Bangladesh Medical Research Council, Bangladesh National Research Council, National Institute of Cancer Research and Hospital etc. and incorporate the universities for the development and modernization of drug manufacturing technologies.Only then will Bangladesh be able to realize the true potential of the pharmaceutical sector.The Father of the Nation Bangabandhu Sheikh Mujibur Rahman is the architect of independent Bangladesh for establishing ultimate emancipation in all sectors for ensuring freedom and prosperity of the peoples. Let the pharmaceutical sector be the ideal workplace for intellectuals of all relevant disciplines without any barrier for knowledge rearing.

ডায়াবেটিস নিয়ন্ত্রনে দারুচিনির ব্যবহার

ড. হাফিজুর রহমান
অধ্যাপক
প্রাইমএশিয়া বিশ্ববিদ্যালয়, বনানী, ঢাকা, বাংলাদেশ

দারুচিনি!

আমরা সবাই কম বেশী এই দারুচিনির সাথে পরিচিত। দারুচিনি আমরা চিনি মসলা হিসেবে। দারুচিনি বাংলাদেশের মানুষের কাছে অতি পরিচিত একটি মসলার নাম। দারুচিনি শুধু বাংলাদেশেই নয়, সারা পৃথিবীতে বিশেষ করে এশিয়ার দেশগুলিতে বহুল ব্যবহৃত একটি মসলা। মসলা খাবারে সুবাস আনে এবং স্বাদে ও গন্ধে বিশেষ অবদান রাখে। মসলার মধ্যে অনেক রকমের বায়োঅ্যাক্টিভ যৌগ থাকে যা হজম এবং বিপাক প্রক্রিয়াগুলিকে প্রভাবিত করে। দারুচিনি বিশ্বের প্রাচীনতম এবং বহুল ব্যবহৃত মসলাদের মধ্যে অন্যতম। দারুচিনির সুগন্ধটা মনোমুগ্ধকর। দারুচিনির ঔষধি ব্যবহার আয়ূর্বেদে ৬০০০ বছরের বেশী সময় ধরে নথিভূক্ত করা আছে। যদিও দারুচিনি মসলা হিসেবে বহুল ব্যবহৃত হয় কিন্তু সেই প্রাচীনকাল থেকে দারুচিনি খাদ্য এবং ঔষধ হিসেবে ব্যবহৃত হয়ে আসছে। দারুচিনি একটি পরিচিত এবং ব্যবহৃত মসলা। আমাদের দৈনন্দিন রান্নায় আমরা দারুচিনি মসলা হিসেবে ব্যবহার করি। দারুচিনি মসলা হিসাবে বহুল ব্যবহৃত হলেও এটি মূলত একটি ভেষজ নিউট্রাসিউটিক্যাল এবং এর রয়েছে অসংখ্য ঔষধী গুনাগুন। আমাদের দেশের মানুষ মসলার পাশাপাশি সর্দি এবং সাধারণ ফ্লু নিরাময়ের জন্য সাধারণত দারুচিনি ব্যবহার করে থাকে।

দারুচিনি এন্টি-অক্সিডেন্ট, এন্টি-মাইক্রোবিয়াল, এন্টি-ফাঙ্গাল, এন্টি-ডায়রিয়াল এবং এন্টি-ডায়াবেটিক হিসেবে কাজ করে। দারুচিনিতে পলিফেনল জাতীয় মৌল'র উপস্থিতির জন্য এটি এন্টি-অক্সিডেন্ট হিসাবে কাজ করে। দারুচিনির অন্যতম সক্রিয় উপাদান সিনামালডিহাইড বিভিন্ন ধরনের ব্যাকটেরিয়া এবং ছত্রাকের সংক্রমনের বিরুদ্ধে লড়াই করতে সাহায্য করে। সিনামালডিহাইডে এন্টি-ফাংগাল এবং এন্টি-ব্যাকটেরিয়াল বৈশিষ্ট রয়েছে যা সংক্রমন হ্রাস করতে পারে এবং দাঁত ক্ষয় এবং দুর্গন্ধ রোধে কার্য্যকরী ভূমিকা রাখে। দারুচিনিতে উপস্থিত এন্টি-অক্সিডেন্টগুলো ফ্রি-র‍্যাডিক্যাল দ্বারা সৃষ্ট রিঅ্যাকটিভ অক্সিজেন মলিকুল এর বিরুদ্ধে লড়াই করার ক্ষমতা রাখে এবং ডায়াবেটিস, ক্যানসার এবং হৃদরোগের মতো রোগ প্রতিরোধে/নিরাময়ে অবদান রাখে।

দারুচিনি একদিকে মোট কোলেস্টেরল, খারাপ এলডিএল কোলেস্টেরল এবং ট্রাইগ্লিসারাইডস এর মাত্রা হ্রাস করে; অপরদিকে, ভাল এইচডিএল কোলেস্টেরল এর মাত্রা বাড়িয়ে দেয়। এভাবে দারুচিনি শরীরের রক্তনালীগুলো থেকে অতিরিক্ত খারাপ কোলেস্টেরল অপসারণ করে হৃদযন্ত্রের কার্য্যকলাপকে সাবলীল ও গতিশীল করে। সাম্প্রতিককালে একটি বড় সমীক্ষায় দেখা গেছে যে, প্রতিদিন প্রায় ১২০ মিলিগ্রামের দারুচিনি এইচডিএল এর মাত্রা উল্লেখযোগ্য হারে বাড়িয়ে দেয়।

হৃদরোগের মডেল প্রাণী গবেষণাতেও দারুচিনির রক্তচাপ হ্রাস করার কার্য্যকারিতা লক্ষ্য করা গেছে। প্রাণী এবং মানব গবেষণার ফলাফল একত্রিত করলে দেখা যায় দারুচিনি হৃদরোগের ঝুঁকিকে উল্লেখযোগ্য ভাবে হ্রাস করতে সাহায্য করে। যদিও দারুচিনির অনেক গুনাগুন বিদ্যমান কিন্তু আমার লেখাটি মূলত ডায়াবেটিস এর মধ্যে সীমাবদ্ধ রাখব।

মেডিসিনাল হার্ব সারা বিশ্বে বিশেষ করে উন্নয়নশীল দেশগুলিতে বহু রোগের নিরাময়ের জন্য ব্যপকভাবে ব্যবহৃত হচ্ছে এবং হবে। আধুনিক ঔষধ আবিষ্কারের আগে ১০০%-ই ছিলো মেডিসিনাল হার্ব। আজও ৫০% আধুনিক ঔষধ প্রত্যক্ষ বা পরোক্ষভাবে প্রাকৃতিক পণ্য থেকে আসে। আর প্রাকৃতিক পণ্য ব্যবহারের সুবিধা এবং অসুবিধা দুটোই আছে। যদিও এটা মনে করা হয় যে প্রাকৃতিক পণ্যগুলো নিরাপদ, তবে এটি সর্বদা সত্য নয়। অনেক প্রাকৃতিক পণ্য ডায়াবেটিস রোগীদের জন্য রিপোর্ট করা হয়েছে তবে খুব কম সংখ্যক প্রাকৃতিক পণ্যের ক্লিনিক্যাল ট্রায়াল সম্পন্ন হয়েছে। দারুচিনি এমন একটি মসলা যার উপর সর্বাধিক ক্লিনিক্যাল ট্রায়াল সম্পাদন করা হয়েছে। দারুচিনির গবেষণা শুধুমাত্র মানব শরীরেই সীমাবদ্ধ থাকেনি; উপরন্ত প্রাণী গবেষণাতেও দারুচিনির বহুল ব্যবহার লক্ষ্য করা যায়। ডায়াবেটিসে দারুচিনির ব্যবহার অনেক পুরানো। অনেকদিন থেকেই ডায়াবেটিস রোগিরা শুধুমাত্র দারুচিনি অথবা অন্যান্য ঔষুধের সাথে দারুচিনি ব্যবহার করে আসছে। দারুচিনির এন্টি-ডায়াবেটিক কার্যকারিতার জন্য অনেক অনেক রিপোর্ট বিদ্যমান। টাইপ-২ ডায়াবেটিস রোগীদের একটি ক্লিনিক্যাল পরীক্ষায় দেখা গেছে যে ১২ সপ্তাহের জন্য প্রতিদিন ২ গ্রাম দারুচিনি গ্রহনের ফলে গ্লাইকেটেড হিমোগ্লোবিন (HbA1c) এর মাত্রা উল্লেখযোগ্যভাবে কমে যায়। অন্য একটি গবেষণায় দেখা গেছে দারুচিনি গ্রহনের ফলে টাইপ-২ ডায়াবেটিস রোগীদের অভূক্ত রক্তের গ্লুকোজ এবং HbA1c যথেষ্ট পরিমান হ্রাস পেয়েছে। মতান্তরে অন্য আর একটি গবেষণায় অভুক্ত রক্তের গ্লুকোজ, HbA1c এবং লিপিড প্রোফাইল এর বিরুদ্ধে দারুচিনির কোনও প্রভাব পাওয়া যায় নি। কিন্তু সাম্প্রতিক প্রতিবেদন, প্রি-ক্লিনিক্যাল এবং ক্লিনিক্যাল পরীক্ষাগুলি প্রমান করে যে দারুচিনি ডায়াবেটিক রোগীদের ক্ষেত্রে রক্তের গ্লুকোজ এর মাত্রা হ্রাস করতে যথেষ্ট কার্য্যকরী ভূমিকা রাখে। সাম্প্রতিক এক ক্লিনিক্যাল গবেষণায় দেখা গেছে এশিয়ান রোগীদের মেটাবলিক প্রোফাইলে দারুচিনি উল্লেখযোগ্য ভূমিকা রাখে। অতি সম্প্রতি সিস্টেমিক পর্যালোচনা এবং মেটা-বিশ্লেষণে দেখা গেছে যে রক্তের গ্লুকোজ, কোলেস্টেরল, ট্রাইগ্লিসারাইডস এবং এলডিএল কোলেস্টেরল কমাতে দারুচিনি কার্য্যকর ভূমিকা পালন করে।

আমার দীর্ঘদিনের ডায়াবেটিস গবেষণার অভিজ্ঞতা থেকে দেখেছি যে,

দারুচিনি এমন একটি মসলা, যা ডায়াবেটিস রোগীদের মহৌষধ। আমার নিজস্ব ডায়াবেটিস এ্যানিম্যাল গবেষণায় দেখেছি যে দারুচিনি ডায়াবেটিস, প্রি-ডায়াবেটিস এবং ডায়াবেটিক জটিলতা- সর্বক্ষেত্রেই কার্য্যকরী ভূমিকা রাখে। গবেষণায় আরও দেখেছি যে, প্রি-ডায়াবেটিস মডেল ইঁদুরে দারুচিনির নির্যাস ৩০ দিন প্রয়োগের ফলে প্রি-ডায়াবেটিসের অবস্থা অনেকটাই স্বাভাবিক পর্যায়ে চলে আসে। দারুচিনি প্রি-ডায়াবেটিক ইঁদুরের GLUT-4 mRNA কার্য্যকারিতা বৃদ্ধি করার ফলে রক্তে গ্লুকোজ এর মাত্রা স্বাভাবিক পর্যায়ে চলে আসে।

টাইপ-২ ডায়াবেটিস সাধারণত দুই ধরনের। স্থুল (obese) এবং অ-স্থুল (non-obese)। স্থুল ডায়াবেটিসে ইনসুলিন এর সংবেদনশীলতা কমে যায়। স্থুল ডায়াবেটিক রোগীদের অনেকেই ইনসুলিন রেজিস্ট্যান্স বা ইনসুলিন এর প্রতি কম সংবেদনশীল। ফলে পর্যাপ্ত পরিমানে ইনসুলিন থাকার পরও ইনসুলিন সংবেদনশীন না হওয়ার কারণে ইনসুলিন তার কাজটি সঠিকভাবে করতে পারে না। সুসংবাদটি হলো দারুচিনি নাটকীয়ভাবে ইনসুলিন এর সংবেদনশীলতা বৃদ্ধি করে এবং এই গুরুত্বপূন্য হরমোনটিকে কাজ করতে সহায়তা করে। শরীরে কার্য্যকরী ইনসুলিন কম থাকার কারণে গ্লুকোজ মেটাবলিজম এর হার অনেক কমে যায় ফলে রক্তে গ্লুকোজ এর পরিমান অনেক বেড়ে যায়। অপরদিকে অ-স্থুল ডায়াবেটিসে ইনসুলিন এর নিঃস্বরণ কমে যায়। প্রয়োজনের তুলনায় কম ইনসুলিন নিঃস্বরণ হওয়ার কারণে রক্তে গ্লুকোজ এর পরিমান বেড়ে যায়। গবেষণায় দেখেছি যে দারুচিনি স্থুল এবং অ-স্থুল দুই ধরনের মডেল ডায়াবেটিক ইঁদুরের ক্ষেত্রেই কার্য্যকর। দারুচিনি অ-স্থুল ডায়াবেটিক ইঁদুরে ইনসুলিন নিঃস্বরণ বাড়িয়ে দেয় এবং অতিরিক্ত নিঃসরিত ইনসুলিন রুক্তের গ্লুকোজ মলিকুলকে ভাঙ্গতে সাহায্য করে। এর ফলে রক্তের গ্লুকোজ এর মাত্রা কমে যায়। দারুচিনির HPLC প্রোফাইল করে দেখতে পেয়েছি যে দারুচিনিতে প্রধান দুটো উপাদান বিদ্যমান: সিনামিক এসিড এবং সিনামালডিহাইড। সিনামালডিহাইড শরীরের অভ্যন্তরে জৈব প্রক্রিয়ায় সিনামিক এসিডে রুপান্তরিত হয়। আমাদের গবেষণায় আমরা দেখেছি যে সিনামিক এসিড বিটা-কোষ থেকে ইনসুলিন নিঃস্বরণ তরান্বিত করে রক্তের গ্লুকোজ হ্রাস করে। আমার গবেষণায় দেখেছি যে, স্থুল ডায়াবেটিক ইঁদুরের ক্ষেত্রে দারুচিনি ইনসুলিন এর সংবেদনশীলতা বাড়িয়ে দেয়। এই ক্ষেত্রে দারুচিনি GLUT-4 রিসেপ্টর কে প্রভাবিত করে আরো বেশী কার্য্যকর করে এবং GLUT-4 এর রিসেপ্টরগুলোকে সেল মেমব্রেন এর কাছাকাছি নিয়ে আসতে সাহায্য করে। কাজেই দেখা যাচ্ছে দারুচিনির নির্যাস দুই ধরনের ডায়াবেটিস (স্থুল এবং অ-স্থুল) এর ক্ষেত্রে দুই রকম পদ্ধতিতে কাজ করে রক্তে গ্লুকোজ এর মাত্রা কমিয়ে আনে।

দীর্ঘদিন অনিয়ন্ত্রিত ডায়াবেটিস থাকার কারণে রক্তে গ্লুকোজ এর পরিমান সব সময় স্বাভাবিক মাত্রার চেয়ে অনেক বেশী থাকে। রক্তের এই অতিরিক্ত গ্লুকোজ রক্তকে দুষিত করে, রক্তকে ভারী করে যার ফলে রক্তের মধ্যে থাকা বিভিন্ন প্রোট্রিন, এনজাইম, হরমোন ও অন্যান্য উপাদানগুলো তাদের স্বাভাবিক গতিতে চলতে পারে না। চলার গতি কমে যায় এবং কমতে কমতে একটা সময়ে এসে স্থবির হয়ে যায়। ফলশ্রুতিতে রক্তের প্রবাহ কমে যায় এবং ডায়াবেটিস জনিত নানা ধরণের জটিলতা দেখা যায়। রক্তে বেশী বেশী গ্লুকোজ থাকার কারণে এই গ্লুকোজ মলিকুলগুলো বিভিন্ন প্রোটিন এর সাথে সংযুক্ত হয়ে গ্লাইকেশন প্রক্রিয়ার মাধ্যমে গ্লাইকেটেড পণ্যে পরিণত হয়। গ্লাইকেশন সবার মধ্যে সব সময় ঘটে তবে ডায়াবেটিসে গ্লাইকেশন এর হারটা অনেক অনেক বেশী। এই গ্লাইকেটেড পণ্যগুলো রক্তের মাঝে এবং শরীরের বিভিন্ন টিস্যু তে জমাট বাঁধতে থাকে। জমাট বাঁধতে বাঁধতে এক সময় একটা পুরু আস্তর পরে যায়। এই পুরু আস্তর এর জন্য রক্ত চলাচল ব্যহত হয় ফলে নানা ধরণের মাইক্রো- এবং মেক্রো-ভাসকিউলার জটিলতা দেখা দেয়। গ্লাইকেটেড পণ্যগুলোর সবচেয়ে ভালো উদাহরণ হচ্ছে গ্লাইকেটেড হিমোগ্লোবিন যা আমরা HbA1c নামে সহজেই জানি। গবেষণায় দেখা গেছে ১% HbA1c হ্রাস করার ফলে ৩৩% মাইক্রো-ভাসকিউলার জটিলতা নিয়ন্ত্রণে আসে। প্রাণী গবেষণায় আমরা পেয়েছি যে দারুচিনির নির্যাস ২-৩% পর্যন্ত HbA1c কমিয়ে আনে। উপরন্ত দারুচিনির নির্যাস রক্তের এবং বিভিন্ন টিস্যুর মধ্যে গ্লাইকেশন এর প্রলেপ পড়াতেও বাঁধা দেয়। কাজেই দেখা যাচ্ছে দারুচিনির নির্যাস ডায়বেটিস জটিলতা প্রতিরোধে অনেক বেশী কার্য্যকর ভূমিকা রাখে। যদিও প্রাণী গবেষণার ফলাফল মানবদেহের জন্য হুবহু একই রকম নয়, কিন্তু দারুচিনির এন্টি-ডায়াবেটিক এক্টিভিটি প্রাণী এবং মানুষ উভয় ক্ষেত্রেই বিদ্যমান। এখন কথা হচ্ছে আমাদের দৈনন্দিন জীবনে দারুচিনি কিভাবে ব্যবহার করতে পারি ? এর একটি সহজ উত্তর হচ্ছে চা'এর সাথে দারুচিনি ব্যবহার। ইদানিং চায়ের সাথে দারুচিনির ব্যবহার লক্ষ্য করা যায়।

দারুচিনি চা একটি কার্য্যকরী পানীয়। এটি এন্টি-অক্সিডেন্ট এ ভরপুর এবং স্বাদ ও গন্ধে অতুলনীয়। চা সারা দুনিয়ার মানুষের কাছে একটা জনপ্রিয় পানীয়। বাংলাদেশের মানুষ সকাল, দুপুর, বিকেল, সন্ধা, রাত এমনকি গভীর রাতেও চা পান করে। বাংলাদেশের মানুষ সাধারণত দুধ চা পান করে। ব্লাক চা (শুধুমাত্র লিকার) এর মধ্যে এন্টি-অক্সিডেন্ট এর মাত্রা সবচেয়ে বেশী। লিকার এর মধ্যে চিনি যোগ করলে এন্টি-অক্সিডেন্ট এর পরিমান কমে যায় আর লিকার এর মধ্যে চিনি এবং দুধ দুটোই মেশালে এন্টি-অক্সিডেন্ট এর পরিমান বহুলাংশে কমে যায়। কথিত আছে যে, ব্রিটিশরা আমাদেরকে যখন চা এর অভ্যাস করিয়েছিলো তখন তা লিকার চা ছিলো। কিন্তু ব্রিট্রিশরা তাদের বিদায় বেলায় চা এর মধ্যে দুধ যোগ করে। চা এর মধ্যে দুধ যোগ করার ফলে চা এর স্বাদ বেড়ে যায় ঠিকই কিন্তু চা এর এন্টি-অক্সিডেন্ট এক্টিভিটি উল্লেখযোগ্যহারে কমে যায়। মজার বিষয় হলো, লিকার চা এর মধ্যে দারুচিনি যোগ করলে চা এর এন্টি-অক্সিডেন্ট এক্টিভিটি নাটকীয়ভাবে বেড়ে যায়। চা এর এন্টি-অক্সিডেন্ট এক্টিভিটির সাথে দারুচিনির পলিফেনল যৌগের এন্টি-অক্সিডেন্ট এক্টিভিটি যোগ হয়ে সিনারজিক এক্টিভিটি প্রদর্শন করে। উপরন্ত দারুচিনি চায়ে একটি সুন্দর ও মনোরম সুগন্ধি সৃষ্টি করে। লিকার এর শেষ পর্যায়ে ২-৩ মিনিট অথবা লিকার চা কাপে ঢালার পর ১ টুকরো দারুচিনি (~১ ইঞ্চি) রেখে দিয়ে কাপটা সামান্য সময় (১-২ মিনিট) ঢেকে রাখলে একটি সুন্দর সুগন্ধি চা তৈরী হয়। যুগ যুগ ধরে বংশ পরম্পরায় আমরা দারুচিনি মসলা হিসাবে ব্যবহার করছি। দারুচিনি চা'তে ব্যবহার করছি। ইদানিং শহরের মানুষ বিশেষ করে যাদের ডায়াবেটিস আছে তাদের মধ্যে চিনি ছাড়া লিকার চা (লাল চা/রং চা) খাবার প্রবনতা বেশি দেখা যায়। এটি একটি ভালো দিক। এই লিকার চা এর মধ্যে দারুচিনি যোগ করলে ডায়াবেটিস রোগীদের জন্য আরো ভালো ফলাফল পাওয়া যাবে। শুধুমাত্র দারুচিনি চা দিয়েই যে ডায়াবেটিস নিয়ন্ত্রনে আসবে এমন কোন কথা নেই। সবচেয়ে ভালো হচ্ছে অন্যান্য ডায়াবেটিস ঔষধ এর সাথে পরিমিত এবং নিয়মিত দারুচিনি গ্রহন করা। এভাবে দারুচিনি ব্যবহার করার ফলে পরবর্তীতে ডায়াবেটিস এর ঔষধ এর মাত্রা হয়তো অপরিবর্তিত থাকবে অথবা বাড়লেও সামান্য বাড়বে। দারুচিনি সবার ক্ষেত্রে সমানভাবে কাজ নাও করতে পারে। যদিও দারুচিনি মসলা হিসেবে বহুল ব্যবহৃত, তারপরও দারুচিনি খাবার পর যদি কারো সমস্যা হয় তাহলে তার দারুচিনি থেকে বিরত থাকাটাই মঙ্গলজনক।

Report from Secretary General Desk

Dr. A.S.M Ansarul Islam
Secretary General (Acting)
BSPP

Dear Respected President, Vice-President and All my fellow Member of BSPP, Invited Guests, Ladies & Gentlemen

Assalamu Alaikum and Good Evening,

I am delighted to welcome you all in the AGM of BSPP, please accept my heartiest felicitations.
We all know that the COVID-19 has changed the global scenario created a great set back in the business world. We are no exception to this situation and it was a very big challenge to conduct different activities of the society . We could not do much in this situation but to keep our society vibrant we could manage to conduct some activities which on behalf of the EC I am presenting here today.
I also take this opportunity to remember our very respected members who have left us for good for the eternal world .
We sincerely remember their contribution towards BSPP and express our deepest condolences. May the Almighty, grant them eternal peace.

Due to the COVID-19 we could manage to conduct the following activities:

1. **Annual Picnic of BSPP** was held on February, 2018 at Nahar Garden, Manikganj.
2. Membership growth: During the period a good number of life members and general members were enrolled
3. **Seminar and Workshops:**

During the year of 2018 to 2021, we have conducted 5 seminars and workshops. We had very satisfactory number of participants for each Seminar/workshop.

No.	Workshop Title	Held on
01.	Quality Risk Management in Pharma Industry	06-07-2019
02.	CAPA Management	29-11-2019
03.	Annual Product Quality Review of Pharmaceutical Products	07-02-2020
04.	Role of Regulatory Affairs in the context of emerging export- oriented Bangladesh Pharma industry and relevant issues. (Virtual Zoom)	12-10-2020
05.	Virtual Seminar on “Understanding COVID-19, Vaccine” (Virtual Zoom)	27-01-2021

On behalf of the EC we sincerely acknowledge your sincere support of you all make the events successful. I am confident that the new committee will add up to our activities, I would also like to show my gratitude our friends in business who have supported us with the advertisements and sponsorships to prepare the souvenir of this AGM.

Please sat blessed and safe along with your family members.

Thank you very much for your patience hearing.

Finance Secretary Report for the Period 2018 to 2020

Mohammad Omar Faruk
Finance Secretary
BSPP

Dear Fellow Member,

On behalf of the Executive Council Members, I'm pleased to present herewith the financial statement of BSPP for the period of 2018 to 2020.

I want to express my deep sorrow for those whom we have lost during the last 3 years. The COVID-19 pandemic delayed our activities. Although, we booked this venue almost 18 months back, unfortunately we could not to organize AGM in time.

However our financial condition is also not very good.

The balance sheet with this letter reflects our present financial status.

Financial Statement of BSPP, Period- 2018 to 2020

	Balance	BDT
1	AGRANI BANK LIMITED, BRANCH: DU	**550,000.00**

	Credit	BDT
1	Income from Traning	114,000.00
2	Advertisement in Souvenir	950,000.00
3	Sponsor from AristoPharma	450,000.00
4	EC Member /Adviser Contributions	21,000.00
5	Member Registration Fee for AGM 2021	240,000.00
6	Monthly Contribution Of EC Member	12,000.00
	Total Credit in BDT	**1,787,000.00**

	Debit	BDT
1	Payment To Advent Pharma	
	Cheque No. MCE 8443023 (06.03.2018) :	200,000.00
	Cheque No. MCE 8443023 (17.07.2018) :	150,000.00
2	Payment To Industrial Ministry (Mr. Mubbasser)	10,000.00
3	Web Page Design	40,000.00
4	Entermainment Expense	25,000.00
5	Souvenir and Bag for AGM	250,000.00
6	Dinnar at AGM, 2021	450,000.00
7	Hall Room Rent	50,000.00
8	Money Receipt Book	3,000.00
9	Total Expences for Trainee	59,000.00
	Total Debit in BDT	**1,237,000.00**

Total Credit	**1,787,000.00**
Total Debit	**1,237,000.00**
Total Balance in BDT	**550,000.00**

BSPP Life Members

Md. Ata-a-Moula
LM - 0001

Mohd. Jawaid Yahya
LM - 0002

A.K.M.A Mannan Mandal
LM - 0005

Md. Rafiqul Islam
LM - 0007

Dr. Firoz Kabir
LM - 0008

Md. A.K Azad
LM - 0009

Sk. Shabbir Ahmed
LM - 0011

Ranjit Kumar Sen
LM - 0012

Prof.Dr.A.I.Mustafa
LM - 0013

Md.Maola Bakhsh Talukder
LM - 0014

M.A. Aziz
LM - 0015

Dr.M. Abdul Hai
LM - 0016

Sk.Nizamuddin Ahmed
LM - 0017

Dr.Sunil Kumar Biswas
LM - 0018

Mohd.Ali Siddiquee
LM - 0019

Modhusudan Shome
LM - 0020

BSPP Life Members

Jakir Hossen
LM - 0021

Md. Ismail
LM - 0022

Md.Ashikur Rahman
LM - 0023

Md.Isar Uddin
LM - 0024

Md.Tazul Islam
LM - 0025

Ruhul Amin Sheikh
LM - 0026

Md. Shorab Hossain
LM - 0027

A.M. Nasir Uddin Ahmed
LM - 0028

Shafia Begum
LM - 0029

Bibekananda Baral
LM - 0030

Md. Masudur Rahman
LM - 0031

Mohd. Nazmul Hasan
LM - 0032

Siddhartha Gupta
LM - 0033

Saroj Kumar Mohajan
LM - 0034

Mohd. Shakhawat Hossain
LM - 0035

Md. Sumon-Al-Rajib
LM - 0036

BSPP Life Members

Md.Sohel Ahmed
LM - 0037

A.N Ashraf Uddin
LM - 0038

A.F.M. Kamrul Islam
LM - 0039

S.M Shahed
LM - 0040

Selim Mohd. Jahangir
LM - 0041

Santosh Kumar Gharami
LM - 0042

Kazi Julhash Uddin
LM - 0043

Md. Mainul Haque
LM - 0044

Debashis Chakraborty
LM - 0045

Md.Tariqual Islam Talukder
LM - 0046

Md.Tariqual Islam Talukder
LM - 0047

Madan Kanti Roy
LM - 0048

S.A. Mainul Islam Chowdhury
LM - 0049

Altabur Rahman
LM - 0050

Chanchal Kumar Talukder
LM - 0051

Late Md. Mofazzal Hossain
LM - 0052

BSPP Life Members

Sukdeb Halder
LM - 0053

Brojen Chandra Mistry
LM - 0054

Binay Bhuson Mondal
LM - 0055

Samir Kumar Bhadra
LM - 0056

Md. Mahamudun Nabi
LM - 0057

Golam Sarwar
LM - 0058

Md.Raihan Hasan
LM - 0059

Md. Abdul Hamid Khan
LM - 0060

Md. Shahabuddin
LM - 0061

Bhabatosh Karmakar
LM - 0062

Md.Abdul Latif
LM - 0063

Kajal Kumar Ghose
LM - 0064

Md. Idrish Ali Howlader
LM - 0065

Mohammod Azizul Islam
LM - 0066

Dipok Kumar Chakraborty
LM - 0067

Md. Akter Hamid Khan
LM - 0068

BSPP Life Members

Md. Ansarul Islam
LM - 0069

Partha Sarathi Biswas
LM - 0070

Shyamal Nandi
LM - 0071

Md. Anowarul Hoque Shah
LM - 0072

Nazrul Islam Khan
LM - 0073

Md. Enayet Hussain
LM - 0074

Md. Habibur Rahman Chowdhury
LM - 0075

Sarabindu K. Saha
LM - 0076

Shahnaz Zaman
LM - 0077

Dr. A.S.M. Ansarul Islam
LM - 0078

Dr. Ahmed Masud Aman
LM - 0079

Md. Josim Al Faruk
LM - 0080

A.K.M. Mahbubuzzaman
LM - 0081

Mr. Roushan Ara Aman
LM - 0082

Dr. S. Shirin Aman
LM - 0083

Dr. Rabeya Khatun
LM - 0084

BSPP Life Members

Prof.Dr.Ishtiaq Mahmud
LM - 0085

Khandker Mostak Ahmed
LM - 0086

Md. Elahi Box
LM - 0087

A.B.M Mahfuzul Alam
LM - 0088

Md.Saiful Islam
LM - 0089

Md.Nasir Uddin
LM - 0090

Md.Aminul Islam
LM - 0091

Md.Zakir Hossain
LM - 0092

Dr. Golam Mohammed
LM - 0093

Md. Rabiul Hassan
LM - 0094

Prof. Dr. Md. Abdus sattar
LM - 0095

Md. Zakir Hossain
LM - 0096

G.M Faruqe Hossain
LM - 0097

Ms Lovely Yeasmin
LM - 0098

Ms Sahnima Tasnim
LM - 0099

Mr. M. Abdul Khaleque
LM - 0100

BSPP Life Members

Rashel Ahmed Khan
LM - 0101

Mr. A.B.M. Borhan Uddin Chowdhury
LM - 0102

Mr. Md. Asaduzzaman Chowdhury
LM - 0103

Mr.Md.Shahidul Islam
LM - 0104

Mr. Md.Omar Faruk
LM - 0105

Dr.Md.Shariful Alam
LM - 0106

Mr.Md Delwar Hossain
LM - 0107

Dr.Anisur Rahman
LM - 0108

Mr.A B m Jamaluddin
LM - 0109

Mr.Md.Nurul Islam (Ronju)
LM - 0110

Mr. Md. Rajibul Al-Azad
LM - 0111

Mr. Rezaul Hossain Khondaker
LM - 0112

Mr. Rakib Ahmed
LM - 0113

Dr. Md. Iqbal Hassan Khan
LM - 0114

Mr.Md.Nadir Hossain
LM - 0115

Mr.Abdul Kader
LM - 0116

BSPP Life Members

Md.Abul Hasnat
LM - 0117

Shagarika Barua
LM - 0118

Dr.M. Fazlul Huq
LM - 0119

A.J.M. Shaheen Ahmamed
LM - 0120

Md. Mohoshin Ali
LM - 0121

Md. Mostafizur Rahman
LM - 0122

Mr.Md. Monjur Alam
LM - 0123

Mr.Kazi Abidur Rahman
LM - 0124

Mr. Dr. Dibyajyoti Saha
LM - 0125

Mr. Md. Bashirullah
LM - 0126

Prof.Dr.Md. Rabiul Islam
LM - 0127

Mr. S.M Sarwar Alam
LM - 0128

Salma Sultana
LM - 0129

Mr. Md. Delowar Hossain
LM - 0131

Mr. Md. Hossain Ali
LM - 0132

Jasmin Ara
LM - 0133

BSPP Life Members

Adeda Sultana
LM - 0134

Mr.Md.Shahidul Islam
LM - 0135

Mr. Md. Sadiqul Alam
LM - 0136

Mr. Md. Jahangir Hossain
LM - 0137

Mr.Md. Selim Reza
LM - 0138

Kaniz Fatima Chhanda
LM - 0139

Mr. Md. Abu Seleim Reza
LM - 0140

Wahida Akter
LM - 0141

Mr.Md.Anowarul Alam
LM - 0142

Mr.Md. Anisur Rahman
LM - 0143

Nitish Chandra Chowdhury
LM - 0144

M. Tanviruzzaman
LM - 0145

Dr. Hakim Rafiqul Islam
LM - 0146

Md. Shamsul Hudh
LM - 0147

Md.Ahsan Habib
LM - 0148

Ms. Shaheda Ferdous
LM - 0149

BSPP Life Members

Bipul Kumar Roy
LM - 0150

Md. Rasheduzzaman
LM - 0151

Md.Amirul Islam
LM - 0152

Md. Rashedul Haque
LM - 0153

Prof. Dr. Firoz Ahmed
LM

Md. Wahidur Rahman
LM

ASM Shameem
LM

Mahfuzur Rahman
LM

Soomna Lohani
LM

Md. Salim Hossain
LM

Dr. Gopinath Dey
LM

Mohammad Rahmatullah
LM

Md. Manirul Islam
LM

Dr. Anjon Kumar Mondol
LM

Md. Jahangir Alam
LM

Enamul Kabir
LM

BSPP Life Members

Subrata Chandra Talukdar

LM

Animesh Bhowmik

LM

Golam Rowshon Azam

LM

Rokonuzzaman

LM

Zannatul Ferdos

LM

Annual General Meeting 2017

1st Committee Meeting 2018

Installation of Central Executive Council 2018-2020

General Meeting 2018

Workshop 2018

Workshop 2018

Annual Picnic

Annual Picnic

AGM Preparing Meeting 2021

Remembering of late Secretary General

BANGLADESH SOCIETY FOR PHARMACEUTICAL PROFESSIONALS

Engagement for A Better Tomorrow

ACKNOWLEDGEMENT

"We are grateful to all the organizations that have contributed to the Annual General Meeting 2021 of BSPP. We wish the success to all the organization on behalf of BSPP."

ACI Limited
Air Solution
AllyTech Corporation Ltd.
Applied Science & Technologies
Aristopharma Ltd
AS Corporation
Beximco Pharmaceuticals Ltd
Chemtech Scientific Limited
Esco Lifesciences (BD) Pvt. Ltd
Furniture Concept & Interior Ltd
Gentry Corporation Limited
H.Q. International
Hamdard Laboratories (WAQF) BD
Imperial Corporation Limited
Integrate Techno Trade
Khan & Deen Traders
Metalon Industries Ltd
Metrohm
Nanotech Corporation
Nesso Tech International
Paradise Scientific Company Ltd.
Relations
Rifat Aluminum
Sarban International Ltd.
Sciencetech Corporation
Shimadzu
Square Pharmaceuticals Ltd
Symport Trading Ltd.
Tech Touch Science & Synergy Ltd
Technotel-Maritime PTE Ltd
Technoworth Associates Limited
The Chromatospec Supplies
The Tawheed Plastic Industries
Thermolab Scientific Equipments Pvt. Ltd
ZK Foils Limited

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