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Information to Authors

Chattagram International Dental College (CIDC) started its historical and memorable journey in the 2013 year. CIDC is the only Private Dental College in Chattogram which is smoothly running under the guidance of Chittagong Medical University.

CIDC is approved by the Government of the Peoples Republic of Bangladesh and is recognised by the Bangladesh Medical and Dental Council (BMDC). CIDC is representing pioneer and exemplary academic and clinical oriented research institute of Bangladesh. About 65 Dental students completed their graduation from CIDC per annum.

Chattagram International Dental College commenced to publish a peer reviewed Journal from 1st January 2018 which is recognized by BMDC and having International Standard Serial Number (ISSN) 2707-2185. The journal intend to publish article of authors from any part of the globe, but has a special interest in publishing research articles of authors from Bangladesh and of relevance to developing countries. It interested in Editorial, Original (Research) articles, Special articles, Review articles, Short Communications, Case report and letters on new findings of Medical Science.

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A structured abstract should not be of more than 250 words. It should be a factual description of the study performed organized with the heading of Background (Includes aim or objectives) Methods (Includes patient population, procedures and data analysis) Result and Conclusion. The abstract should contain the data to support the key findings or conclusions of the study and this should be self explanatory without references to the text. the first time an abbreviated term is used it should be spelled out in full form and follow with the abbreviation in parentheses for example :- CKD (Chronic Kidney Disease). Please do not cite any references in the abstract.

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Chattagram International Dental College Journal requires authors to declare any competing financial or other interest in relation to their work. Where an author gives no competing interests, the listing will read the author (s) declare that they have no competing interests.

Editorial

Chattagram International Dental College Journal

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Thalassemia is a Public Health Concern : Bangladesh Perspective

Mahmood Ahmed Chowdhury[1*]

Thalassemia is a blood disorder passed down through inherited in which the body makes an abnormal form or inadequate amount of hemoglobin. Hemoglobin is the protein in red blood cells that carries oxygen. The disorder results in large numbers of red blood cells being destroyed which leads to anemia.

There are main two types of thalassemia:-

i) Alpha Thalassemia-Occures when a gene or genes related to the alpha globin protein are missing or changed.

ii) Beta Thalassemia- Occures when similar gene defects affect production of the beta globin protein.

Inherited hemoglobin disorders are increasingly recognized as a global public health concern, with arround 3,20,000 babies born annually with clinically significant variants of these conditions.[1] Nearly 80% of these births occur in developing countries. Most conservative estimates suggest that at least 5.2% of the world population (Over 360 million) carry a significant hemoglobin variant and in excess of 100 million beta thalassemia carriers with a global frequency of 1.5%.[1,2] Homozygous or compound heterozygous states between certain variants can lead to clinical manifestations of hemoglobinopathies.

The inherited beta thalassemias including sickle cell anemia and Hemoglobin E (HbE) disorders are the most frequent single gene disorders globally.[1] Thalassemia syndromes are caused by an absence or ineffective synthesis of beta globin chains. Hemoglobinopathies are most prevalent in certain malaria prone parts of the world including Africa, all Mediterranean countries, the Middle East, the Indian subcontinent and Southeast Asia.[1,3] In each year, over 50,000 new patients are born with a severe form of thalassemia (Beta-thalassemia major and HbE beta thalassemia) worldwide. Due to high rate of international migration, thalassemias are spreading to non-endemic parts of the world.[2] In many Asian countries, the most common form of thalassemia results from the coinheritance of beta thalassemia and HbE. In the eastern parts of Indian subcontinent, Bangladesh and other Southeast Asian countries, HbE is the most prevalent hemoglobin variant.[4]

South Asia, a hotspot of hemoglobinopathies, is home to 23% of the world's population (Approximately 1.7 billion).[2,5] Due to extreme heterogeneity, an uneven frequency of beta thalassemia heterozygote or carrier in the range of 1 and 10% has been reported throughout different parts of India.[2] However, the overall prevalence of beta thalassemia carriers has been estimated to be between 2.78 and 4% in India.[6,7] This number translates to approximately 30-48 million beta thalassemia carriers in India and approximately 5-12 million carriers in Pakistan with a carrier rate of 5-7%.[2,8]

Bangladesh is one of the most densely populated countries in the world, with a population of over 171.2 million peoples.[9] Over 70% of the population live in highly resource-constrained rural areas, while most tertiary hospitals are located in big cities, notably in Dhaka. Public hospitals are often overcrowded and lack resources (Such as specialized and basic medical equipment, healthcare professionals and essential drugs).[5,10] On the contrary, some private clinics and hospitals are relatively resourceful but these are not accessible to the general population due to the associated costs. The treatment drop-out rate among a population plagued by poverty is expected to be very high, and is presumably driven by lack of access, either due to lack of awareness or income of patients seeking care on the demand side or inadequate expertise, facilities, knowledge and infrastructure from the supply side of health care.

Despite the fact that Bangladesh lies in the world's thalassemia belt, the information on different aspects (Epidemiology, clinical course, mortality, complications and treatment outcomes) of thalassemias is lacking. A recent study has revealed that the higher prevalence of anemia in Bangladesh is not associated with iron deficiency.[11] The nationwide prevalence of anemia (33.1% in children under five years of age and 26% in women) was more than three times higher than that of iron deficiency in children (10.7%) and women (7.1%) suggesting other determining factors for this unexpected scenario.[11]

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In this context, the role of congenital Hb disorders along with micronutrient (Such as dietary iron, vitamin A, folate and Zn) deficiency could explain this phenomenon.[11] A recent study has indicated that about 28% of assessed rural women have beta thalassemia or HbE.[12]

Because of phenomenal success in the control of infectious diseases in Bangladesh, child mortality has declined by 71% as compared to that observed in the 1990s.[13] Genetic disorders, particularly thalassemias, are therefore likely to be a major public health concern in Bangladesh in the coming decades.[14] Beta thalassemia carriers can have mild anemia with Hb level ranging from 9 to 12 g/dL which does not warrant transfusion to normalize the Hb level. Individual response and adaptation to anemia may also play a role in selecting patients for transfusion. On the other hand, in case of HbE beta thalassemia, the most crucial issue is to determine transfusion dependence.

In Bangladesh prevention of thalassemia can successfully be done by developing premartial screening through the primary health care system and mandatory blood test before marriage registration.

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Original Article

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Analysis of the Influence of Heat Treatment on Partially Cyclic Fatigued Endodontic Files: In a Vitro Study

Sakib Ibn Mujib[1*] A.K.M. Bashar[2] Md. Abdul Gafur[3] Rahela Yeasmin[4]
Atiyah Hasin[5] Kawsar Jahanara Akther[6]

Abstract

Background: *According to several previous studies, heat treatment may increase the cycle fatigue arrest of utilized files; nevertheless, it is unclear exactly what and how heat treatment affects partially cyclic fatigued files. To analyze the influence of heat treatment on partially cyclic fatigued files.*

Materials and methods: *Four different brands of nickel-titanium rotary filesare included in this study. Each file system had 24 new files and was divided into groups A(n=12) and B(n=12). Group B was divided into two subgroups, B1 (n=6) and B2 (n=6). All 12 files from group A of each file system were exposed to cyclic load for fatigue test in the fatigue testing device and the mean Number of Cycles to Fracture (NCF) for each file system. All the files in subgroup B1 and subgroup B2 were cycled to 50% of mean NCF and 75% of mean NCF respectively. These instruments were exposed to heat treatment in a furnace at 400°C temperature. Then, like group A, the files in subgroups B1 and B2 were exposed to cyclic load in a fatigue testing device. Time to separationwasnoted for apieceendodontic file from apiece system in seconds. NCF was calculated from that.*

Results: *The outcome of heat treatment on partially cycled endodontic file regarding cyclic fatigue resistance, all four file systems obtained statistically significantly better cyclic fatigue resistance after heat treatment than their respective non-heat-treated endodontic file. ($p < 0.05$).*

Conclusion: *Based on the present study it can be concluded that heat treatment can improve cyclic fatigue arrest of endodontic NiTi files.*

Key words

Cyclic fatigue resistance; Heat treatment; Partially cyclic fatigued files.

Introduction

Nickel-titanium (NiTi) alloys offer the files flexibility and better adjustment to the curved root canals.[1] Comparing this innovation to traditional stainless steel hand files, there are several significant advantages: increased flexibility, increased cutting efficiency, shortened preparation times and procedural error and less debris extrusion.[2,3,4] Despite all the gains of NiTi files, file fracture during clinical useis a major drawback of NiTi files. Fracture of NiTi files befalls due to either torsional or cyclic fatigue.[5,6] The fracture due to cyclic fatigue befalls when files are exposed to repetitive compression and tension forces within the curved canals.[7]

The fatigue life depends on several variables including stress level, stress state, cyclic waveform, fatigue situation and metallurgic settings of the materials. Small changes can significantly affect fatigue manners, making an analytic guess of fatigue life difficult.[8]

Over the past several years, manufacturers have tried different new tactics to improve cyclic fatigue resistance. One of these tactics is heat treatment. Zinelis et al. showed that heat treatment on NiTi rotary instruments can extend their fatigue life due to plummeting residual strain.[9]

In the case of partially fatigued files through using, researchers claim that initiation of cyclic fatigue may be revocable through proper heat treatment that increases fatigue life.[10] Heat treatment has been suggested to improve the fatigue life of NiTi files and inverse the stress-induced martensite transformation to the parent austenite phase.Furthermore, it may converse the crack initiation in NiTi alloy.[11] Heat treatment diminishes dislocation in the crystal structure taking place in fatigue but there are some research gaps concerning this issue as some studies have shown that heat treatment may not be the most persuasive parameter for flexural resistance.[12] That way there is some muddle still exists. It has been also

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recommended for further exploration. Therefore, the purpose of this study is to appraise the effect of heat treatment on partially cyclic fatigued files.

Materials and methods

This in vitro investigation was carried out in the Department of Conservative Dentistry and Endodontics, Faculty of Dentistry, Bangabandhu Sheikh Mujib Medical University (BSMMU) and the Department of Pilot Plant and Process Development Center, BCSIR.The methodology was based on earlier research.[7,13] Thestudy included four rotary file systems,

i) ProTaper Gold F2 files

ii) Hyflex CM files (ISO 25 and taper 0.06%)

iii) WaveOne Gold files (Primary)

iv) 2 Shape files (ISO 25 and taper 0.06%).

Every file measured 25 mm. There were 24 new files in each file system.

The files of each system were divided into two groups. Group A (n=12), Group B (n=12). Files of Group B again were divided into two subgroups, subgroup B1 (n=6) and subgroup B2 (n=6). An optical stereomicroscope with a ×20 magnification was used to examine every piece of equipment, doing a morphologic study and searching for any indication of visible deformation. There were no defective instruments discovered.

The specially designed cyclic fatigue testing apparatus was set up with a hand piece holder attached to a steel base so that the hand piece was positioned exactly concerning the replicated canal holder. A stainless-steel tube with a diameter of 2 mm was bent to create the mimic canal. Bending the tube at 60° angles of curvature and 5 mm radii of curvature allowed for the replication of the canal's curvature. In a curved portion of the canal, the radius's center was 5 mm from the tube's tip. The tube measured 20 mm in entire length.

All the files in group A of each system were exposed to cyclic load in the fatigue testing device to find out the mean NCF for each system. Then all the files in subgroup B1 and subgroup B2 of each system were cycled in a fatigue testing device to 50% of mean NCF (According to group A) and 75% of mean NCF (According to group A) respectively. The files were driven by the Wismy endo motor and the attached files were inserted into the artificial canal from the top and extruded around 2 mm from the distal end. During the file testing process, glycerin was used to grease the fake canal. Per the manufacturer's recommendations for each file system, the files were moved at a constant speed and torque. The files were rotated until a fracture happened. It was monitored how long it took for the instrument to separate&noted then calculated in seconds. NCF was calculated from that.The files in subgroups B1 and B2 were faced with heat treatment in a furnace at 400°C. The temperature was amplified gradually up to 400°C. Thereafter, the instruments were kept at that temperature for 15 minutes. Then they were furnace-cooled. The files in subgroup B1 and subgroup B2 were exposed again to cyclic load in the fatigue testing device after heat treatment. The files were rotated until a fracture happened. It was monitored how long it took for the instrument to separate and noted then calculated in seconds. NCF was calculated from that.

The time was calculated in seconds(s). Time to fracture was measured visually using a digital stopwatch set to 1/100 seconds. The following formula was used to determine the NCF:

Speed (rpm) x Time to Fracture (s)/60 = NCF.

More NCF means more cyclic fatigue resistance.

SPSS statistical software (Version 26.0) was used to finish the statistical analysis. Next, the standard deviation and mean values were computed. Repeated measurements of one-way ANOVA were used to compare the data, and Bonferroni's correction was applied for multiple comparisons. The p-value was chosen at less than 0.05.

Results

In the present study, heat treatment demonstrated a positive influence (Beneficiary) over cyclic fatigue resistance individually in all four types of tested endodontic files (Fig-1). When heat treatment was provided in two different groups of partially cyclic fatigued four types of endodontic files, both 50% partially cyclic fatigued (Subgroup B1) and 75% partially cyclic fatigued files (Subgroup B2) showed increased resistance to cyclic load than nonheat treated files (Group A) (Fig 1). Mean NCF difference in Hyflex CM files subgroup B1 and B2 with group A were 1306.6 and 1290.12 respectively. For both the subgroups (B1 and B2) result differences were statistically significant (p<.001) (Table II). A similar outcome was also observed in the case of Wave One Gold, ProTaper Gold and 2Shape files (Table II).

While comparing the influence of heat treatment on different levels of partially cyclic fatigued files, early application of heat treatment appeared more beneficial. Heat-treated 50% partially fatigued files (Subgroup B1) came out higher in resistance (Mean NCF 4751.4 ± 304.2) than 75% partially fatigued files (Subgroup B2), (mean NCF 4734.9 ± 521.1), although the mean NCF difference (16.53) was not statistically significant (Table I and II). A similar Comparative feature was also observed for WaveOne Gold, ProTaper Gold and 2Shape files (Table I and II).

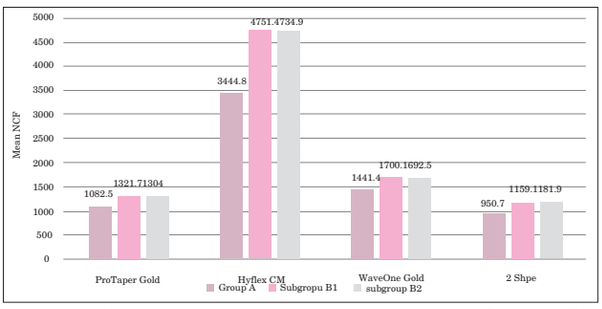

Figure 1 50% partially cyclic fatigued (Subgroup B1) and 75% partially cyclic fatigued files (Subgroup B2) showed increased resistance to cyclic load than non-heat treated files (Group A)

Table I Comparison of cyclic fatigue resistance among Group A (Without heat treatment) Subgroup B1 (With heat treatment after being cycled 50% of mean NCF) and Subgroup B2 (With heat treatment after being cycled 75% of mean NCF) (n=24)

Rotary file systems	Group A (n=12)	Subgroup B1 (n=6)	Subgroup B2 (n=6)	p-value
ProTapter Gold	1082.5±87.5	1321.7±60.4	1304.0±75.8	<0.001*
Hyflex CM	3444.8±363.7	4751.4±304.2	4734.9±521.1	<0.001*
WaveOne Gold	1441.4±94.3	1700.7±33.1	1692.5±30.6	<0.001*
2Shape	950.7±106.8	1159.1±54.0	1181.9±80.9	<0.001*

Data were expressed as mean±SD.

ANOVA was used to compare four Rotary file systems, *significant.

Table II Post hoc (Bonferroni) test used for multiple comparisons between groups (Group A, Subgroup B1, Subgroup B2)

			Mean Difference	p-value	95% Confidence Interval	
					Lower	Upper
ProTapter Gold	Group A	Subgroup B1	-239.27*	<0.001*	-341.9876	-136.4257
		Subgroup B2	-221.41*	<0.001*	-324.1943	-118.6324
	Subgroup B1	Group A	239.27*	<0.001*	136.4257	341.9876
		Subgroup B2	17.79	1.000	-100.8879	136.4746
	Subgroup B2	Group A	221.41*	<0.001*	118.6324	324.1943
		Subgroup B1	-17.79	1.000	-136.4746	100.8879
Hyflex CM	Group A	Subgroup B1	-1306.66*	<0.001*	-1820.3314	-792.9919
		Subgroup B2	-1290.12*	<0.001*	-1803.7981	-776.4586
	Subgroup B1	Group A	1306.66*	<0.001*	792.9919	1820.3314
		Subgroup B2	16.53	1.000	-576.6014	609.6680
	Subgroup B2	Group A	1290.13*	<0.001*	776.4586	1803.7981
		Subgroup B1	-16.53	1.000	-609.6680	576.6014
WaveOne Gold	Group A	Subgroup B1	-259.37*	<0.001*	-352.6173	-166.1294
		Subgroup B2	-251.11*	<0.001*	-344.3506	-157.8627
	Subgroup B1	Group A	259.37*	<0.001*	166.1294	352.6173
		Subgroup B2	8.26	1.000	-99.4021	115.9355
	Subgroup B2	Group A	251.10*	<0.001*	157.8627	344.3506
		Subgroup B1	-8.26	1.000	-115.9355	99.4021
2 Shape	Group A	Subgroup B1	-208.36*	<0.001*	-326.3079	-90.4155
		Subgroup B2	-231.13*	<0.001*	-349.0812	-113.1888
	Subgroup B1	Group A	208.36*	<0.001*	90.4155	326.3079
		Subgroup B2	-22.77	1.000	-158.9659	113.4192
	Subgroup B2	Group A	231.13*	<0.001*	113.1888	349.0812
		Subgroup B1	22.77	1.000	-113.4192	158.9659

*. The mean difference is significant at the 0.05 level.

Table II shows subgroup B1 and subgroup B2 do not have any difference from each other. But both separately show significantly ($p<0.05$) superior cyclic fatigue resistance to Group A that is factual for all four file systems.

Discussion

In this investigation into the impact of heat treatment on endodontic files used for cyclic fatigue resistance, each of the four file systems (ProTaper Gold, Hyflex CM, WaveOne Gold, and 2Shape) obtained statistically significant ($p<0.05$) improvements in cyclic fatigue resistance following heat treatment compared to the corresponding non-heat-treated endodontic file (Table II).

After heat treatment, Pro-taperGold files in subgroup B1 (With heat treatment after being cycled 50% of mean NCF) and subgroup B2 (with heat treatment after being cycled 75% of mean NCF) obtained greater resistance to cycle fatigue than files that were not heat-treated. (Group A) The mean NCF difference is 239.2 and 221.5 respectively. Results of subgroups B1 and B2 are significantly ($p<0.05$) higher than group A. A similar effect of heat treatment has been found in the case of Hyflex CM. Mean NCF difference of subgroup B1& B2 to group A 1306.6 and 1290.1 respectively. The result is significant ($p<0.05$).

For WaveOne Gold files results of subgroups B1 and B2 are significant ($p<0.05$). superior to group A. Mean NCF difference of subgroup B1 and B2 to group 259.32 and 251.12 respectively. Similarly, for 2 Shape files mean NCF difference of subgroup B1 and B2 to group A 208.4 and 231.2 respectively. The result is significant ($p<0.05$).

The application of heat treatment over partially fatigued files produces a positive outcome in the present study. Mean NCF after heat treatment at different levels (50% and 75%) of partially fatigued files was found much higher than that was before heat treatment (Fig 1). This came out true individually for all four types of tested file systems. Even the mean NCF in both 50% partially fatigued files and 75% partially fatigued files after heat treatment were significantly higher than without heat treatment group. A possible cause of such positive influence is that heat treatment may converse the stress-induced martensite transformation to the parent austenite phase.[11] Heat treatment may reverse the changes in microstructure on used endodontic files.[10]

The present study's conclusions can be trusted because the four file systems all show the same pattern of heat treatment influence on cycle fatigue resistance. Previous research conducted by Özyürek et al. and Sharroufna et al. also supports the current study's findings.[7,14] In the Özyürek et al. investigation, they discovered that ProTaper Gold files after heat treatment achieved superiority to files without heat treatment, the mean NCF difference was 261.13.[7] The results were significant ($p<0.05$). In the study done by Sharroufna et al. they found for EdgeFile X7 statistically ($p<.05$) significant superior result after heat treatment (Mean NCF difference 443.0).[14]

When heat-treated partially fatigued files were compared at different levels of fatigue (50% and 75%) in between, 50% of the partially heat-treated files had a mean NCF that was higher than 75% of the moderately fatigued files. However,

there was no discernible statistical difference. Better results by heat treatment achieved in 50% partially fatigued files than in 75% partially fatigued files may be due to crack propagation occurring at 75% partially fatigued files as observed by Pruett et al.[15]

This study result also gives an idea that the application of heat treatment in minimal fatigue (minimum clinical use) may produce better cyclic fatigue resistance.

Limitations

Evaluating the results of this investigation would have been more suitable if the salt bath heat treatment had been applied over endodontic files.

Conclusions

It is possible to deduce from the current investigation that heat treatment can increase the endodontic NiTi files' resistance to cyclic fatigue.

Recommendations

To prolong its use in clinical practice, heat treatment can be used to partially exhaust files.

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Disclosure

All the authors declared no competing interest.

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Original Article

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Health and Economic Impacts of Climate Change on Factory Workers in Chattogram, Bangladesh

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Abstract

Background: *Climate change poses significant challenges to workers' health and economic stability worldwide, particularly in industrial settings like shipyards. Understanding the specific impacts on factory workers is essential for devising effective mitigation strategies. This study aimed to assess the health and economic impacts of climate change onworkers at Chittagong Shipyard, Bangladesh.*

Materials and methods: *A quantitative cross-sectional study was conducted from January to June 2023. involving 200 factory workers. Data on demographic characteristics, health impacts, and economic consequences were collected using a structured questionnaire during field visits to the shipyard. Quantitative analysis, including frequencies, percentages, and averages, was performed to analyze the data.*

Results: *The study revealed significant findings regarding the health and economic impacts of climate change on factory workers. Among the surveyed workers, 90% reported experiencing extreme heat, with an average monthly loss of Tk 25,000 due to reduced productivity. Furthermore, 80% suffered from humidity-related issues, and 60% incurred medical expenses, amounting to Tk 15,000 monthly. Absenteeism affected 90% of workers, resulting in an average loss of Tk 20,000 per month.*

Conclusion: *The findings underscore the substantial burden of climate change on factory workers at Chittagong Shipyard, highlighting the urgent need for interventions to safeguard their health and economic well-being.*

Key words

Climate change; Economic impacts; Factory workers; Health impacts; Shipyard.

Introduction

A report in 2020 highlighted that the years from 2010 to 2019 marked the hottest decade in the past 140 years, with 2020 emerging as the warmest year on record, underscoring the urgent reality of climate change.[1,2] Despite contributing minimally to global emissions, poorer nations bear the brunt of its negative effects.[3,4] Bangladesh, a developing country, faces severe repercussions from climate change, as emphasized by prominent figures in the climate action movement.[5] The World Bank estimates that over 140 million individuals in regions like sub-Saharan Africa, South Asia, and Latin America could be impacted by climate change by 2050.[6] In 2019 alone, 24.9 million people were displaced due to weather-related events, with Bangladesh being a frequent site of such disasters.[3] These demographic shifts not only threaten national security and development but also risk undoing decades of progress and inciting international unrest.[7]

The 2017 Global Climate Risk Index by German watch identified Bangladesh among the top 10 countries most affected by climate change.[3,8] As stated in the Johannesburg Declaration on Sustainable Development, Bangladesh faces significant challenges in its quest for economic stability.[8] The economic toll is especially heavy on populations near or below the poverty line, leading to migration, loss of livelihoods, and reduced job opportunities due to heightened economic vulnerability and property damage.[9] Climate change-induced adverse health effects, including physical injuries, psychological stress, and various diseases such as cardiovascular and respiratory ailments, cancer, and kidney diseases, are prevalent in Bangladesh.[10-12] The lack of timely social and economic support exacerbates the plight of the poor and vulnerable, resulting in food shortages, and inadequate access to safe drinking water, sanitation, and basic civic amenities.[8,13,14] This study aimed to assess the health and economic impacts of climate change onworkers at Chittagong Shipyard, Bangladesh.

Materials and methods

This quantitative cross section study was conducted at Chattogram Shipyard which aimed to comprehensively

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assess the health and economic implications of climate change on factory workers. The study took place at Chittagong Shipyard, Bangladesh, spanning from January to June 2023. Employing a cross-sectional design, data were collected using a structured questionnaire administered during field visits to the shipyard. The questionnaire was meticulously developed to capture demographic characteristics, health impacts, and economic consequences attributed to climate change. Prior informed consent was obtained from all participants, and strict measures were taken to ensure confidentiality and ethical compliance throughout the research process. Data analysis involved quantitative methods, including statistical tools and software, to compute frequencies, percentages, and averages. This research methodology aimed to provide valuable insights into the challenges faced by factory workers and identify potential interventions to mitigate these impacts, contributing to evidence-based strategies for climate change adaptation and worker well-being.

Results

Table I Demographic Data

Demographic Characteristic	Number	Percentage
Gender (Male)	160	80%
Gender (Female)	40	20%
Age Group (Years)		
18-30	80	40%
31-40	60	30%
41-50	40	20%
51 and above	20	10%
Educational Level		
Primary Education	40	20%
Secondary Education	80	40%
Higher Secondary Education	60	30%
Tertiary Education	20	10%
Years of Employment		
Less than 5 years	100	50%
5-10 years	60	30%
11-15 years	30	15%
More than 15 years	10	5%
Housing Status		
Own House	120	60%
Rented House	60	30%
Other	20	10%
Monthly Income (BDT)		
Less than 10,000	80	40%
10,000 - 20,000	60	30%
20,001 - 30,000	40	20%
More than 30,000	20	10%

The demographic data table provides a comprehensive overview of the surveyed factory workers in Bangladesh. Eighty percent of the respondents identified as male, while 20% were female. Age distribution shows that 40% of the workers fall within the 18-30 age group, followed by 30% aged 31-40, 20% aged 41-50, and 10% aged 51 and above. In terms of educational attainment, 40% have completed secondary education, 30% have attained higher secondary education, 20% have primary education, and 10% have tertiary education. Regarding years of employment, 50% have worked for less than 5 years, 30% for 5-10 years, 15% for 11-15 years, and 5% for more than 15 years. Housing status reveals that 60% own their houses, while 30% rent, and the remaining 10% live in other arrangements. Monthly income distribution shows that 40% earn less than 10,000 BDT, 30% earn between 10,000 and 20,000 BDT, 20% earn between 20,001 and 30,000 BDT, and 10% earn more than 30,000 BDT (Table I).

Table II Difficulties Faced in Workplace Due to Climate Change

Difficulty	Impact	Number Affected	Percentage (%)	Severity (1-5)
Extreme Heat	Yes	180	90%	4.5
Humidity	Yes	160	80%	4.0
Increased Pollution Levels	Yes	120	60%	3.5

This table focuses on the difficulties faced by factory workers in their workplace due to climate change in Bangladesh, excluding cyclones/storms or floods. Extreme heat impacts 90% of workers, with a severity rating of 4.5 out of 5, indicating its significant impact. Humidity is a challenge for 80% of workers, with a severity rating of 4.0. Increased pollution levels impact 60% of workers, with a severity rating of 3.5 (Table II).

Table III Health Impact-Related Data

Health Parameter	Number Affected	Percentage (%)	Frequency of Occurrence (Per month)	Severity (1-5)
Respiratory Issues	50	25%	3-4	3.5
Heat-related Illnesses	30	15%	2-3	3.0
Skin Problems	40	20%	2-4	3.0
Musculoskeletal Disorders	60	30%	4-5	4.0
Mental Health Issues	20	10%	2-3	2.5

The health impact-related data table offers a detailed insight into the prevalent health issues among factory workers in Bangladesh. Approximately 25% of the

surveyed workers experience respiratory issues, while 15% suffer from heat-related illnesses. Skin problems affect 20% of the workers, and musculoskeletal disorders are prevalent among 30% of them. Mental health issues are reported by 10% of the respondents. Furthermore, the table provides information on the frequency of occurrence per month for each health parameter, ranging from 2 to 5 times, and severity ratings on a scale of 1 to 5 (Table III).

Table IV Economic Impact-Related Data Due to Climate Change

Economic Parameter	Impact	Number Affected	Percentage (%)	Average Monthly Loss (BDT)	Severity (1-5)
Medical Expenses	Yes	200	100%	Tk 15,000	3.5
Absenteeism	Yes	180	90%	Tk 20,000	4.0
Reduced Productivity	Yes	160	80%	Tk 25,000	4.5
Job Loss	Yes	120	60%	Tk 50,000	5.0
Property Damage	No	0	0%	-	-
Additional Transportation	No	0	0%	-	-

The economic impact-related data table provides a comprehensive depiction of the financial repercussions of climate change on factory workers in Bangladesh. Notably, all surveyed workers are affected by medical expenses, representing 100% of respondents, with an average monthly loss of Tk 15,000. Absenteeism impacts 90% of workers, resulting in an average monthly loss of Tk 20,000, while reduced productivity affects 80% of workers, leading to an average monthly loss of Tk 25,000. Job loss, the most severe economic impact, is experienced by 60% of workers, with an average monthly loss of Tk 50,000. However, none of the workers reported property damage or incurred additional transportation expenses due to climate change-related factors (Table IV).

Discussion

Comparing the findings with existing research provides valuable insights into the broader context of climate change impacts and underscores the urgent need for targeted interventions.In terms of demographic characteristics, the study revealed that 80% of the surveyed workers were male, with 40% falling within the 18-30 age group. This demographic distribution aligns with similar studies conducted in industrial settings, reflecting the predominant demographic profile of factory workers in Bangladesh.[12] However, a notable finding is the higher proportion of workers with secondary education (40%) compared to tertiary education (10%) suggesting potential disparities in educational attainment among factory workers.The difficulties faced by factory workers in their workplace due to climate change highlight the severity of environmental challenges in Bangladesh. Extreme heat impacts 90% of workers, with a severity rating of 4.5 out of 5, underscoring the urgent need for heat stress prevention measures. Similarly, humidity affects 80% of workers, indicating the pervasive nature of climate-related discomfort in industrial settings. These findings are consistent with studies conducted in other regions, which emphasize the adverse effects of extreme heat and humidity on worker productivity and well-being.[10,11]

The health impact-related data reveal a concerning prevalence of respiratory issues (25%), musculoskeletal disorders (30%), and mental health issues (10%) among factory workers. These findings corroborate previous research highlighting the adverse health effects of climate change, including respiratory ailments due to air pollution and mental health disorders stemming from prolonged exposure to stressful working conditions.[13,14] Moreover, the frequency of occurrence per month for each health parameter underscores the chronic nature of these health issues, necessitating comprehensive health interventions and workplace accommodations.

Economically, the study elucidates the profound impact of climate change on factory workers' livelihoods, with 60% experiencing job loss and 90% facing absenteeism. The average monthly loss of Tk 50,000 due to job loss underscores the devastating economic consequences of climate change-induced disruptions in industrial sectors. These findings align with studies conducted in other vulnerable regions, which highlight the disproportionate economic burden borne by low-income populations in the wake of climate-related disasters[12].

Conclusion

The findings of this study underscore the multifaceted impacts of climate change on factory workers in Chattogram, Bangladesh. By comparing the results with existing research, the study highlights the urgent need for coordinated efforts to mitigate climate change effects, safeguard worker health and economic well-being, and promote resilience in vulnerable communities.

Disclosure

All the authors declared no competing interest.

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Original Article

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Oral Health Status among Primary School Going Children in a Selected School of Chattogram City

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Abstract

Background: *Oral health is an important aspect of overall health. If neglected, it can have adverse effects on the academic performance of school-going children, reducing their ability to attend school regularly and reach their full potential. Therefore, this study aimed to evaluate the oral health status of primary school children in a selected school located in Chattogram City.*

Materials and methods: *It was a descriptive type of cross-sectional study conducted from July to December 2022. The study place was CDA Public School & College of Chattogram City. The data were collected from 235 primary school-going children of classes three and four. The age of them was between 9-11 years. Data collection was done through face-to-face interviewsand a convenient sampling technique was used in this study. For data collection, a semi-structured questionnaire was used. The analysis was done by using SPSS-26.*

Results: *In this study, it was observed that the majority of the participants were 10-year-old male students. The findings revealed that 32% of the students experienced dental pain, 26% reported teeth sensitivity, 21.7% had bleeding gums, 21.7% had abraded teeth, 19.6% suffered from BDRBDR (Broken Down Teeth) and 15.7% had teeth mobility. Shockingly, 57% of the students admitted to not brushing their teeth at night. Furthermore, 64% of the participants were found to have decayed teeth, 23.8% had missing teeth, and 9.8% had filled teeth due to carious conditions.*

Conclusion: *This study found that the majority of primary school children have experienced various dental problems, indicating poor oral health. It is crucial to continue awareness programs to address this issue.*

Key words

Children; Oral health status; Primary school.

Introduction

Oral health is an important aspect of overall health. It is important to prioritize good oral health practices to ensure overall well-being.[1] Good oral health is not only important for maintaining healthy teeth and gums, but it also plays a crucial role in maintaining overall health. Many general diseases can first manifest in the mouth and oral diseases can be the first warning sign of other life-threatening health conditions. It is essential to maintain good oral hygiene and visit the dentist regularly to prevent and detect any potential problems. Good oral hygiene can dramatically affect the quality of a person's life, affecting such things as chewing, eating, swallowing, speaking, facial aesthetics, and social interaction.[2] The oral cavity is known to be a reservoir for pathogens to grow and thrive. Poor oral hygiene can lead to complications such as gingivitis, halitosis, xerostomia, plaque formation etc.[3]

The school-age period is a dynamic time for physical, mental and social development in children.[3] Schools are considered to be crucial venues for reaching out to children and through them, their families and the wider society.[4] The World Health Organization (WHO) recommends promoting oral health in schools to increase awareness of oral health issues and encourage changes in students' attitudes and behaviors. School children play an important role in preventing health problems and educating their families and communities. They can serve as a means to bring about positive changes in their families.[5]

In developing countries like Bangladesh, due to poor hygiene practices school-age children often experience an increased burden of communicable diseases that decreases their ability to attend school regularly and learn their full potential.[6] Most of the common dental diseases can be controlled only if the individual patient exercises a considerable measure of initiative and responsibility.[2]

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Maintaining good oral health is crucial to prevent dental caries, gum disease and other health problems. Therefore, it's important to be aware of the oral health status and prevalent issues of a specific age group. To minimize the risk of dental caries, it's recommended to brush your teeth twice a day with fluoride toothpaste. Additionally, it's best to avoid consuming acidic food and drinks before bedtime.[2]

Bangladesh, being a densely populated country, faces significant oral health challenges. However, there is a lack of comprehensive data on oral health problems specifically related to primary school-going children. Therefore, this study aimed to evaluate the oral health status of primary school-going children in a selected school in Chattogram City.

Materials and methods

This cross-sectional study was conducted among primary school children of CDA Public School and College, Chandgaon, Chattogram from July 2022 to December 2022. A pre-tested semi-structured questionnaire was used in this study from children aged 9-11 years who were willing to participate. Students with cognitive impairments and those who were unwilling to participate were excluded from the study. Face-to-face interview was conducted for data collection followed by a minor oral health check-up. Dental mirror, caries probe, tweezer, and torch were used as data collectiontools for the oral health check-ups of the students.

In this study, the sample size calculation formula was: $n = z^2pq/d^2$. After calculation, the estimated sample size was 235.The questionnaire was written in English and then translated into the local language Bangla and used for data collection.

This study utilized a convenient type of non-probability sampling. Before data collection, we obtained written informed consent from the school authority and explained the purpose of the study. We also informed the students about the aimof the study and the data collection procedure before collecting data from them. The participation of the students in this study was voluntary, and we let them know they could withdraw themselves at any time.

The questionnaire was divided into three parts. The first part contained details related to socio-demographics, the second part pertained to oral conditions, and the third part was about oral examination. The collected data was checked for consistency, relevancy, and quality control. The data was then compiled, coded, cleared, categorized, re-coded, and analyzed using SPSS software. The analysis plan was developed based on the objectives and variables of this study. The data was presented in tables and graphs for assessing categorical responses.

Results

Table I Socio-demographic characteristics of the primary school students (n=235)

Age in Years	Frequency	Percentage
9	76	32.3
10	99	42.1
11	60	25.5
Total	235	100.0
Class	Frequency	Percentage
3	123	52.3
4	112	47.7
Gender	Frequency	Percentage
Male	114	48.5
Female	121	51.5
Total	235	100.0

According to Table I, the majority of the students (42.1%) were 10 years old, followed by 32.3% who were 9 years old and the remaining 25.5% who were 11 years old. Out of all the students, 52.3% belonged to class three and the remaining 47.7% were from class four. The number of male and female participants was almost equal, with 51.50% being male and 48.50% being female.

Table II Distribution of students according to tooth brushing material and type of dentition (n=235)

Brushing material	Frequency	Percentage
Toothpaste	233	99.1
Charcoal	2	.9
Toothbrush	235	100.0

According to Table II all of the students (100%) used toothbrushes as brushing devices, the majority of the students (99.1%) used toothpaste and only a few students used charcoal as toothbrushing material.

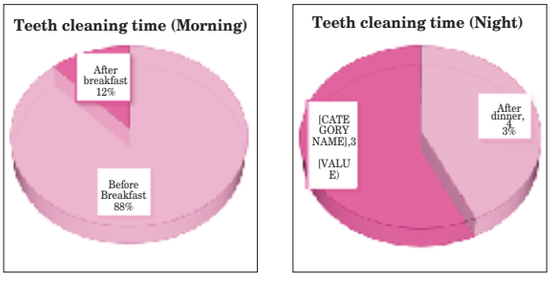

Figure 1 Distribution of students according to tooth brushing time (n=235)

According to Figure 1, the majority of students (88.1%) brush their teeth before breakfast, while only 11.9% brush their teeth after breakfast in the morning. Additionally, at night, a significant number of students (57%) did not brush their teeth.

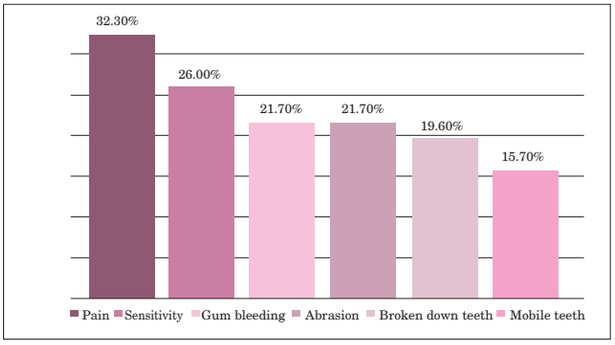

Figure 2 Distribution of students according to dental problems(n=235)

According to Figure 2, out of 235 students, 76 (32.3%) experienced dental pain, 61 (26%) suffered from teeth sensitivity, 51 (21.7%) had bleeding from gums, 51 (21.7%) had abraded teeth, 46 (19.6%) had BDR, and 37 (15.7%) had teeth mobility.

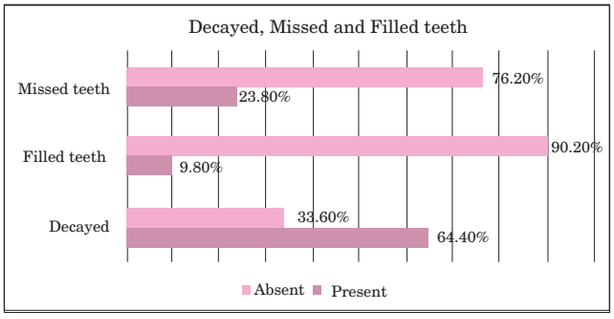

Figure 3 Distribution of students according to decayed, missed and filled teeth status (n=235)

Accordingto decayed, missed and filled teeth status of the 235 students, 64.4% were present with decayed teeth, 23.8% missed their teeth and 9.8% had filled their teeth due to carious condition teeth.

Table III Relationship between gender and caries status of students(n=235)

Gender	Caries status of students		Total
	Caries Absent	Caries Present	
Male	43	71	114
Female	36	85	121
Total	79	156	235

According to Table III, both male and female students are almost the same as prevalent in dental caries.

Discussion

In this study among the 235 primary school-going children, male and female participants were almost the same, 51.50% and 48.50% respectively, 123 (52.3%) students were from class three, and the rest 112 (47.7%) were from class four.

The study findings were quite engrossing. It was observed that all of the 235 students who participated in the study, utilized toothbrushes for cleaning their teeth. It was also noted that the vast majority of students, that is 99.1%, used toothpaste for brushing their teeth, which is a good thing as it helps in maintaining good oral hygiene. However, only a small number of students used charcoal for cleaning their teeth, which is not a very common practice. Another study in Dhaka, Bangladesh showed that about 80% of students always used toothpaste.[7] The differences may be due to variations in both studies setting.

The findings of this study revealed that a significant portion of the 235 students surveyed experienced various oral and dental issues. Specifically, 32.3% of the students reported dental pain, while 26% experienced tooth sensitivity. Additionally, 21.7% of the students reported gum bleeding, and the same percentage reported abraded teeth. Furthermore, 19.6% of the students had BDR (Broken Down Teeth) and 15.7% experienced tooth mobility. These results highlight the need for increased awareness and preventative measures to address these common dental problems among students. Another study showed 24% had dental pain and 7% had gum bleeding.[7]

The survey conducted on 235 children revealed some interesting insights about their dental hygiene habits. Shockingly, 57% of children, or 134 in number, did not brush their teeth at night. However, it was found that a significant majority of them (88.1%) were in the habit of brushing their teeth before breakfast. Only 11.9% of the children brushed their teeth after breakfast in the morning. These findings suggest that there is a need to educate children about oral health and hygiene practices.

The oral and dental health status of 235 students was thoroughly evaluated in terms of their missing, decaying, and filled teeth to determine the prevalence of dental issues. The results of the assessment were quite concerning as they revealed that 64.4% of the students had carious teeth, indicating that untreated tooth decay was rampant among the student population. Additionally, 23.8% of the students had missing teeth, which could be due to various factors such as tooth decay or extraction. Furthermore, 9.8% of the students had fillings due to carious conditions, which highlights the severity of the tooth decay problem among the students. Another study conducted in India found that dental caries was a significant problem for school-going children, with around 58% of them suffering from the condition. This is an alarming statistic as dental caries can lead to several complications such as tooth loss, abscesses, and even systemic infections if left untreated.[8]

Conclusion

This study revealed that the majority of primary school children have experienced various dental problems and have poor oral health. The study provides an overview of the current oral health status of primary school children. The findings of this study can be used to develop programs aimed at achieving optimal health for children.

Recommendation

Enhancing school-based oral health education programs and continuing mass awareness programs can help improve this condition.

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Disclosure

Both the authors declared no competing interest.

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Original Article

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The Effect of Health Education program in Chronic Low Back Pain Management

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Abstract

Background: *Health education is the study of health and wellness. It involves teaching people how to lead healthly lives, prevent and treat diseases and make wise healthcare decisions. To evaluate the outcome of programmed health education along with traditional conservative managementin patients with chronic low back pain.*

Materials and methods: *Prime working adults (Aged 25–54 years) with low back pain of 3 months'duration were randomized to undergo a 12-weeks programme of conservative treatment with lumber muscles strengthening exercise and health education or exercise alone. Initial baseline and after completion of treatment were assessed by Pain, disability (Oswestry Disability Index : ODI) and health-related quality-of-life (Short form-36, SF-36).*

Results: *Pain, disability, SF-36 were significantly better in the health education group (n ¼ 25) than in the control group (n ¼ 24) at the end of the 12-week.Regarding static endurance there was no significantdifferences between-groups.*

Conclusion: *Health education provides additional benefits to conservative alone for improving pain, disability and mental and physical health-related QoL.*

Key words

Health education; low back pain; lumber strengthening exercise.

Introduction

Low Back Pain (LBP) is the commonest musculoskeletal problem that affects 80% of people at any point in their lifetime.[1] Direct and indirect costing LBP in increasing worldwide which is about $100 billion in USA annually.[2] Chronic LBP is treated with exercise and life style modifications for ADLs (Activities of daily living) which is provided by health educationprogramme.[3–5] Health education includes active management and/or postural modifications. Active management means to avoid those movements that worsen pain, and encourage physical activity.[6] The aim of postural modifications is to educate the patient how to perform ADLs in such technique that lumber muscle tension and spinal load arereduced.[7]

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For the management of chronic LBP,European guidelines recommend back pain education to reducesick leave and disability.[8] Improvements in pain, disability and healthrelated quality-of-life are proved by simultaneous use of health education and conventional care.[9] But, regarding rates of self-reported pain, disability or sick leave, some haven't found significant differences between control and health education groups.[10] Effect of health education program for chronic LBP patients is beneficial or not is unclear. This study assessed the effects health education programme plus conventional treatment versus conventional treatment without health education program on pain, disability and health-related quality of life in patients with chronic LBP in order to evaluate whether health education was beneficial in these patients.

Materials and methods

This randomized, controlled study included prime working adults with chronic LBP who were attending in OPD of Physical Medicine & Rehabilitation in Marine City Medical College & Hospital, Chattogram, Bangladesh. Patients were enrolled between October 2022 and June 2023 according to inclusion and exclusion criteria.

Inclusion criteria

(i) Prime working adults (Aged 25–54 years)[11]

(ii) Have LBP (With or without radiation to lower limbs) for 3 months

Exclusion criteria

(i) Severe pain (VAS - Visual Analogue Scale pain score >8)

(ii) Participated in a back pain education programme before

(iii) Previous spinal operation

(iii) Progressive neurological deficit, structural anomaly, severe instability

(iv) Acute infection, severe cardiovascular or metabolic disease.

All participants completed a questionnaire prior to randomization, which collected information including baseline demographic data, medical history, exercise schedule and occupational status. Allocation of the participants was done by computer-generated random number sequence in a 1 : 1 ratio to either the health education group or the control group.

Ethical clearance was taken from Ethics Committee of Marine City Medical College, Chittagong, Bangladesh. After approval of the study all patients provided written informed consent.

All patients got lumbar strengthening exercises program two session a week for 12 weeks under the guidance of registered physical therapists. The aim of exercises program was to focus on trunk flexor and extensor muscles.[4] Each session included: (i) Warm-up-5- min (ii) Trunk flexor strength exercises-15-min (iii) Trunk extensor strength exercises-15-min (iv) Cool-down-5-min.

Patients in the health education group participated education sessions once a week for 3 weeks. Health education program provided a lecture (30 min) followed by discussion (10 min) and information was shared by audiovisual powerpoint presentation and instruction leaflets in local language. Contents included images, videos and written info regarding anatomy, pathogenesis, management and life style modifications for ADLs such as avoiding risk factors for back problems, safe lifting practices and posture correction for reducing back muscle tension and spinal load.

Assessment of outcome measures was done at baseline and at the end of the 12-week intervention programme by an investigator who was blinded to group allocation (L. W.) Outcome measuring tools included: (i) Pain intensity (VAS)[12] (ii) Oswestry Disability Index (ODI) higher values indicate more severe disability[13] (iii) Statictrunk extensor sendurance (Length of time in seconds) that the patient could enable to hold their unsupported upper body in the prone position[14] (iv) Health-related QOL (Short Form-36 [SF-36] Health Survey, higher scores indicate better QOL).[14]

Data were presented as mean SD. Between group comparisons of baseline data were made using χ^2-test or independent samples 't' test. Effects of treatment were evaluated by using two-way analysis of variance (Group time). Statistical analyses were performed by using Microsoft Office Excel 2010 software and SPSS version 20.0 for Windows. p-values <0.05 were considered statistically significant.

Results

70 patients recruited in this study. After exclusions and with drawals, the final analysis included 59 patients (Health education group n¼ 30, control group n¼ 29, Figure 1). Initial baseline demographic data and clinical features are shown in Table I. No statistically significance was found between-group differences regarding any baseline data.

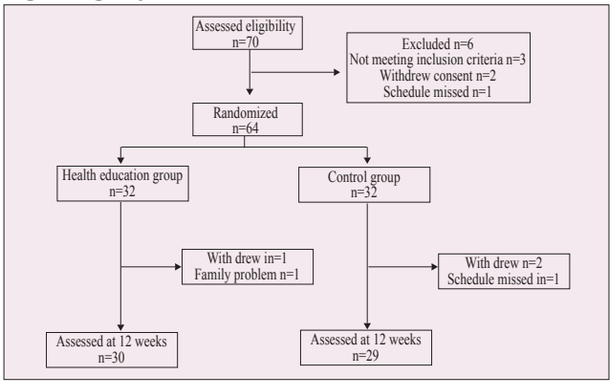

Figure 1 Flow of patients through a study to assess the value of health education and conservative treatment versus conservative treatment alone, in patients with chronic LBP

Table I Baseline demographic and clinical characteristics of patients with chronic LBP included in a study to evaluate the value of health education and conservative treatment versus conservative treatment alone (control).

Characteristic	Health education group n¼ 32	Control group n¼ 32
Male/female	17/15	19/ 13
Age, years	45.29 2.85	47.04 2.24
Height, cm	151.93 7.29	159.07 7.31
Body weight, kg	71.96 7.57	73.07 5.25
BMI, kg/m^2	25.02 2.85	26.41 1.95
Duration of back pain, months	7.93 3.67	8.45 3.47
Pain, VAS	5.59 1.53	5.78 1.19
Disability, ODI[12]		
Health-related quality-of-life, SF-36[15]	44.78 9.32	47.19 11.40
Physical component	54.28 20.62	48.23 22.78
Mental component		
Static endurance, s	81.76 14.11	79.83 15.19
Flexion	61.35 45.51	58.39 47.91
Extension	72.07 45.11	69.56 45.95

Data presented as n or mean SD.

BMI-Body Mass Index, VAS-Visual Analogue Scale, ODI-Oswestry Disability Index, SF-36-36-Item Short Form Health Survey.

No statistically significance was found between-group differences. (p 0.05, χ^2-test for sex, independent samplest-test for all other variables).

Table II shows data for all outcome measures at the end of the 12-week of intervention. Patients in the health education group had significantly better pain, disability, SF-36 physical component and SF-36 mental component scores than those in the control group (p<0.001, p¼0.025, p<0.001 and p¼0.011 respectively. There wasno statistically significance was found between-group differences in static muscle endurance.

Table II Clinical characteristics of patients with chronic low back pain following a 12-week intervention program of health education and conservativetreatment versus conservativetreatment alone (Control).

Parameter	Health education group n¼ 25	Control group n¼ 24	Statistical significance[a]
Pain, VAS	2.12 1.46	2.61 1.88	p <0.001
Disability, ODI[12]	13.17 7.11	16.668.48	p ¼ 0.025
Health-related quality-of-life, SF-36[14]			
Physical component	91.92 14.02	73.68 24.87	p <0.001
Mental component	88.84 13.93	81.35 13.11	p ¼ 0.011
Static endurance, s			
Flexion	77.65 66.49	71.28 57.86	NS
Extension	86.99 52.57	81.95 55.63	NS

Data presented as mean SD.

VAS: Visual Analogue Scale (0, no pain, 10, worst pain) ODI :Oswestry Disability Index, SF-36, 36-Item Short Form Health.

Discussion

This randomized controlled study evaluate the comparison between health education plus conservative treatment and conservative treatment alone for the treatment of chronic LBP, and showed that health education is beneficial regarding pain severity, disability and physical and mental health-related QoL in comparison to conservative treatment alone.

Some studies proved health education can reduce pain and job abstinence, butninereview RCT found no effect of health education on preventing LBP.[16,17,10] The outcome and findings of the this study has proved that health education is effective to improve pain and disability in prime worker patients with chronic LBP. The shorter duration of the health education program may the point to explain the cause of less significant between-group differences in muscle endurance in the present study. A longer health education program may beneficial for static muscle endurance improvement.

Limitation

The present study had few limitations. First, the study only done among the prime worker patients aged 25–54 years, therefore the findings cannot be applied among all age groups. Further studies are required to evaluate the effect of health education in other age groups, particularly the elderly. Secondly, it was quite impossible for patients and physical therapists to be blinded to group allocation. Thirdly, the sample size was small, limiting the value of the findings. Finally, there was no long-term follow-up in our study.

Conclusion

In conclusion, health education for back pain provides additional benefits over conservative treatment alone for improving the pain, disability and health-related quality-of-life of prime worker patients (Aged 25–54 years) with chronic LBP.

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Disclosure

All the authors declared no competing interest.

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Original Article

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Perception of Facial Esthetics by Dental Professionals and Laypersons among Patients with Extraction of Premolar vs Nonextraction Orthodontic Treatment

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Abstract

Background: *Facial esthetics are cosmetic treatment designed to accentuate and enhance natural facial features through a non-surgical procedure. The purpose of the study was to assess perception of facial esthetics by dental professionals and laypersons.*

Materials and methods: *This cross-sectional analytical study was accomplished at Department of Orthodontics and Dentofacial Orthopedics of Dhaka Dental College and Hospital, Dhaka from March 2020 to January, 2021 among conveniently selected 60 patients of Bangladeshi origin (Age range: 13-30 years). The patients included in this study were orthodontic patients treated with extraction of upper first premolars where extraction was indicated and treated without extraction where extraction was not necessary.*

Results: *The participants were divided according to sex and treatments option (i.e. Extraction and non-extraction). Paired 't'-test was done to compare the esthetic scores, scored by two groups, dental professionals and lay persons. Significant difference of score by lay persons and professional esthetic was observed for females both in extraction and non-extraction groups.*

Conclusion: *The differences between patients' and dentists' perceptions of such esthetic needs can be inferred from how laypeople and dental professionals perceive face esthetics.*

Key words

Dental professionals; Facial esthetics; Layperson; Perception.

Introduction

Physical attractiveness plays an important role in how we view ourselves and how we are viewed by others. Dentofacial attractiveness is a major determinant of overall physical attractiveness.[1] Personality development and social interaction are significantly affected by facial esthetics in both males and females. In social interaction, attention is usually directed toward the mouth and eyes of the speaker's face, suggesting that the smile is an important feature of facial appearance.[2]

Facial and smile attractiveness play a key role in social interaction.[3] It is also believed that attractive people are more likely to obtain better jobs, have more successful marriages, and experience happier, more fulfilling lives.[4]

Aesthetic refers to understanding of beauty. Aesthetic in orthodontic treatment have always been associated with profile enhancement. Facial beauty and harmony are the primary treatment objectives. An attractive balanced smile is prime objective of modern orthodontic therapy. The modern orthodontic treatment includes not only occlusal harmony but also enhancement of facial appearance at the end of treatment.[5]

Most common cause of the people seeking for orthodontic treatment is an unpleasant facial appearance. The aim of an orthodontist is to achieve a pleasing facial and dental aesthetics by establishment of a stable occlusion. It is of prime importance that the final results are not dependent only on the looks alone. The topic has become important for clinicians to evaluate the outcome of treatment by their smiles and overall enhancement is their facial appearance to produce optimal facial aesthetics.[6]

Esthetics in orthodontics is divided into three sections:

i) Micro aesthetics, which includes the dental aspect, considering the arrangement of teeth on the arches, their color shapes, shape dimensions and proportions

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ii) Miniaesthetics, which includes smile esthetics, how teeth are exposed and perceived in smile dynamics, specially in relation with the lips and excessive buccal corridor

iii) Macroaesthetics, which refers to the face, its harmony and proportions, and the aesthetics impact of several structure in its composition.[7]

Currently, people's esthetics requirements and expectations have increased substantially. Therefore, dentists have been seeking ways to provide excellent treatment results. Therefore, it is necessary to investigate what the other specialties in dentistry except from orthodontics.[8]

Human beauty perception is a relative concept impacted by a variety of elements, including but not limited to demographic, geographic, ethnic and cultural influences. One of the main driving forces for pursuing cosmetic face surgery, dentistry and/or orthodontic procedures is beauty. People generally perceive facial aesthetics differently according to a variety of circumstances, such as social context and experiences. As a result, it's critical to balance the patient's preferences and requirements with the aesthetic qualities that laypeople and dentists find pleasing.[9] Numerous research assessed the perceptions of dental professionals and/or laypeople about particular facial esthetic characteristics, such as "facial symmetry," "facial vertical proportions," and "facial profile." The purpose of this study was to evaluate how dental professionals and laypeople perceived facial esthetic in relation to gender to evaluate the outcome of treatment by their smiles and overall enhancement in their facial appearance to produce optimal facial aesthetics.

Materials and methods

This cross-sectional analytical study conducted between March, 2020 to January, 2021 at Department of Orthodontics and Dentofacial Orthopedics of Dhaka Dental College and Hospital, Dhaka included 72 conveniently selected patients of Bangladeshi origin of whom 12 were rejected due to procedural error. Finally 60 patients were included in the study. Approval was obtained from the Ethical Committee of Dhaka Dental College, and patients were enrolled based on specific criteria, excluding those with obvious facial asymmetry, excessive gingival smile line, increased overjet and overbite, open bite, presence of any local pathology such cyst, tumor, periodontal disease, missing anterior teeth, anterior dental anomalies like malformed teeth, transposition of teeth. The patients included in this study were orthodontic patients treated with extraction of upper first premolars where extraction was indicated and treated without extraction where extraction was not necessary and belonged to the age group of 13-30 years.

The patient's anonymity was preserved and informed consent was acquired. Following a thorough explanation of the intended use of the images, facial photos of each individual were taken. There was no interview, and the participants didn't do anything that would make them feel less confident in themselves or embarrassed. The patient was not denied any information.

The subjects were divided into two groups. Group-A of 30 cases treated with extraction of upper first premolar and group-B of 30 cases treated without extraction were selected. Post treatment standardized frontal photograph of the patients were taken during a pleasing natural smile (Figure 1).

Figure 1 Post treatment frontal photograph

A Nikon D40 camera (Nikon Corporation, Tokyo, Japan) was used to take the pictures. With the patient seated and facing the researcher, the grin photos were taken with the lens level with the lips. Every person was told to maintain their heads in their normal positions. Patients were instructed to grin as naturally as possible, with their teeth in their normal, maximum intercuspation positions. The same individuals took all of the standard photos at the same 30-inch distance while adhering to the necessary specifications, such as the tripod height and camera resolution for every sample. It was made sure that every grin aesthetic sample used the identical procedure.

The photographic records were analyzed with the software for Windows, adobe photoshop 9.0 version (Adobe system, San Jose, California). Esthetic score was evaluated by a panel of 10 lay persons (Five females and five males aged between 20 to 30 years) and 10 dental professonals. They all scored the post-treatment photographs on a scale of 10.

All the data were analyzed through standard statistical method by using SPSS software version 20. Paired t-test was used to compare the mean scores from two panels. The confidence level was set by 95%, so a p-value less than 0.05 was considered as statistically significant level.

Results

The age of the respondents ranged from 13 to 30 years. The mean age of Group-A (Extraction) was 20.7±5.06 years and that of Group–B (Non-Extraction) was 22.03±5.51 years. Females were predominant in both groups (60.0% in Group A and 63.3% in Group B).

Table I Comparison of Means of Esthetics Scores rated by Professionals and Lay persons between the extraction and non-extraction groups (n=60)

Sub-group	Professional Mean±SD	Lay Person Mean±SD	t-value	p-value
Group A (Male) (12)	2.45±0.62	2.71±0.74	1.475	0.052
Group A (Female) (18)	2.52±0.54	2.93±0.81	1.903	0.034 s
Group B (Male) (11)	2.74±0.37	2.62±0.35	-1.290	0.052
Group B (Female) (19)	2.71±0.76	3.11±0.36	1.693	0.043 s

S = Significant.

Paired t-test was done to compare the scores by two groups regarding esthetic scores by professionals and lay persons among various groups (Male and female participants in Group A and Group B). Significant difference of score by lay persons and professional esthetic was observed for females (Table I).

Discussion

The study results compared mean values of the esthetic scores rated by professionals and lay persons among various groups (Male and female participants in extraction and non-extraction groups) and showed that significant difference of esthetic score by lay persons and professional esthetic score in case of females. According to Prasad et al. the post-treatment inter canine widths of the maxillary and mandibular arches were again the same in the extraction and non-extraction groups.[10] Prahl-Andersen et al. and Cheng et al. indicated that dentists and laypersons judge facial aesthetics differently as dentists have been trained to observe features that do not seem to influence the general public.[11,12] Ghaffar and Fida, the smiles evaluated by laypersons did show any significant difference (p=0.8) between the extraction and non-extraction groups.[13] Orthodontists were more critical than lay people in detecting minor discrepancies. Some studies of Martin et al. have suggested that lay people rated more highly than dental professionals whereas some studies of Gracco et al. Krishnan et al. have shown no difference between the observations by dental professionals and lay people.[14-16]

The smile that is well accepted and appreciated by one group may not be accepted by another group. So, this study is very important to understand what could be the expectation of the patient and improves orthodontic treatment quality will be helpful for the clinicians for their daily practices. This study may introduce a new modality to the orthodontists of Bangladesh that can bring about effective smile aesthetics in a period of time.

Limitations

- The study was done in single center with very minimal samples. So the findings might not represent the national situation.
- Tribal population was not included.

Conclusion

There are differences between judged facial attractiveness and non-extraction vs. extraction therapy, orthodontic vs. layperson. The disparity between patients' and practitioners' perceptions of such esthetic demands can be seen in how different dental practitioners and laypeople with varying levels of training and clinical experience perceive face esthetics.

Recommendation

Multi-center research consisting of large sample group for greater acceptability of the study is recommended for future researchers.

Disclosure

All the authors declared no competing interest.

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Review Article

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Prime Vaccines Against COVID-19 : A Review

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Abstract

Background: *Homo Sapiens are quite vulnerable in the face of natural crisis. Undoubtedly COVID-19 is a natural crisis also. Since the outbreak of the COVID-19 pandemic, there has been a rapid expansion in vaccine research focusing on exploiting the novel discoveries on the pathophysiology, genomics and molecular biology of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV 2) infection. The induction of vaccines as primary prevention is crucial to eradicating the disease to attempt restoration to normalcy. This review aims to describe the Biotechnology of the vaccines and how the spike protein is used as a target to elicit an antibody dependent immune response in homo sapiens.*

Methodology : *Meticulous study of selected published articles through Google Search.*

Conclusion: *It is imperative that people are vaccinated as quickly as possible until herd immunity can be achieved.*

Key words

Antibody; COVID-19; Immune; Pandemics; SARS-CoV-2; Spike protein; Vaccine.

Introduction

Human civilization is largely helpless when confronted with natural disasters. A novel beta coronavirus that causes severe pneumonia was first described in December 2019, in Wuhan, the capital city of Hubei province, in China.[1] Subsequently, it was given the name Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) and the disease Coronavirus Disease 2019 (COVID-19) rapidly spread to a global pandemic.[2] World has witnessed its devastating effects resulting in huge loss of life, jeopardised health care delivery system and economies.

COVID-19 pandemic caused by the Severe Acute Respiratory Syndrome Coronavirus 2(SARS-CoV-2) has affected is over 70,47,53,890 cases and 70,10,681 death as of 2nd May 2024.[3] Still many more are suffering from post COVID-19 complications. It posed a huge burden to the health care particularly for ICU bed, oxygen, and ventilator initially. The whole world is waiting eagerly to see the the end of the COVID-19 pandemic. Scientists, researchers and world leaders working accordingly to curtail the pandemic by implementing the measures to prevent the transmission of the SARS-CoV-2 virus, using effective therapies for the disease, and vaccination to prevent infection. Health measures like universal masking, hand washing with soap water and physical distancing are useful in prevention of transmission of the virus. Effective vaccines are developed in a very short period of time and the global vaccination program is going on successfully.[4]

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Immune protection in COVID-19 infection can be conceptualized as a spectrum wherein sterile immunity is at the end of positive spectrum. This is followed by transient infection (<3 days) and asymptomatic infection (~1 week). The negative spectrum of immune protection includes patients who are symptomatic, or hospitalized, or admitted to the intensive care unit for multi organ support. The extreme end of the negative spectrum of immune protection is encompassed by case fatality. The vaccine will intervene prior to the viral insult and stabilize the population at the positive end of the spectrum of the immune protection. It will also prevent the perpetuating cycle of infection and reinfection via variants of SARS-CoV-2 virus in those who have achieved prior convalescence. One study by Dan et al. showed that in patients infected with COVID-19, immunological memory to SARS-CoV-2 remained intact for up to 6 months.[5] Unfortunately, there is no long-term data on the duration of protected immunity against SARS-CoV-2 in patients after convalescence. Therefore, these patients may also require vaccination but the current priority for vaccination can be stretched relative to the unaffected population.

The COVID-19 vaccine roll-out is to instill a global herd immunity. Vaccination may be to reduce mortality and stress on healthcare systems by reducing the cases of admitted patients. Various countries have already approved COVID-19 vaccines for human use, and more are expected to be licensed in the upcoming year. It is important that these vaccines are safe, efficacious and can be deployed on a large scale. It is also prudent to eliminate the concerns of both the scientific and general community regarding its effectiveness, side-effects and dosing strategies.

This review aims to describe the Biotechnology of the

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vaccines and how the spike protein is used as a target to elicit an antibody dependent immune response in humans. In addition dosing strategies, efficacy and side effects will be discussed for the prime vaccines : BioNTech/Pfizer, Moderna, Astrazeneca, Janssen, Gamaleya and SinoVac.

Search Strategy

The study was carried out during the period from 15th April to 30th April 2024. Available studies and abstract were identified through PubMed and Google Scholar (2011-2024). Key search topics were "Prime Vaccines Against COVID-19: A Review" and relevant articles from references list of reviwed articles were also searched. The search term were the following key words used in combination : Antibody; COVID-19; Immune; Pandemic; SARS-CoV-2; Spike protein; Vaccine.

Discussion

Concept

Vaccine : A vaccine is defined as any substance which is used to stimulate the production of antibodies, in turn providing immunity against diseases.

COVID-19 : It is a highly infectious disease caused by the Corona Virus SARS-CoV-2. The first known case was identified in Wuhan, China in the year December 2019. The disease quickly spread worldwide, resulting in the COVID-19 pandemic. The major symtoms of COVID-19 are variable but often include fever, fatigue, cough, breathing probles, loss of smell and taste.

Vaccine Biotechnology

The global burden of the pandemic requires an efficacious vaccine that elicits a lasting protective immune response against SARS-CoV-2. This will be an essential armament for the prevention and mitigation of the downstream morbidity and mortality caused by SARS-CoV-2 infection. Approximately 108 vaccines in clinical development and 184 vaccines in pre-clinical development with several vaccines being distributed globally.[6]

The technologies employed in the vaccine synthesis and development aim to trigger the adaptive immune system and elicit memory cells that will protect the body from subsequent infections. These technologies may be mRNA-based vaccines such as the Moderna and Pfizer/BioNTech, inactivated virus vaccines, DNA vaccines and numerous other technologies.[7]

Due to the urgent implementation of vaccine development, the most obvious target will be the robust proteins expressed on the surface of the virus. Therefore, these technologies target molecular expression of the trimeric SARS-CoV-2 spike (S) glycoprotein. These targets could include its mRNA, DNA, full S1 subunit or fusion subunits. The S protein is a major component of the virus envelope, it is vital for viral fusion, receptor binding and virus-entry through recognition of host-cellular receptor. The S protein comprises of two main functional units, the S1 subunit, which contains the Receptor-Binding Domain (RBD) and the S2 subunit which is responsible for virus fusion with the host-cell membrane.[8] The choice to proceed with S protein as the target was reinforced when a study confirmed that in 169 patients infected with SARS-CoV-2, spike-specific Immunoglobulin G (IgG) remained stable for over 6 months.[5] In addition, both spike-specific CD4+ T-cells (CD137+ and OX40+) and spike-specific CD8+ T-cells (CD69+ and CD137+) were present at the 6-month post-convalescence period, but their subpopulations exhibited a steady decline with a half-life of 139 days and 225 days, respectively.[5]

Vaccines usually contained adjuvants which are protein sensitizers that heighten the migratory and sampling response of Antigen Presenting Cells (APCs). Interestingly, the current mRNA vaccines are engineered to code for their own sensitizing protein alongside the S-protein epitopes. Therefore, these new mRNA vaccines usually do not contain any adjuvants. In addition, the mRNA vaccines utilize lipid nanoparticles to deliver the genetic material of a viral S-protein. Contrastingly, vaccines such as the AstraZeneca vaccine may employ a chimpanzee adenovirus vector to carry the DNA genome of the S-protein to the host-cell.[9] Once undergoing the processes of transcription and translation into proteins, these are trafficked and expressed on the host cell surface wherein the adaptive immune system mounts a response via the Major Histocompatibility Complex (MHC) molecules.

There are two types of MHC molecules, the first one that will be discussed is the MHC-II, which is found exclusively on APC: these comprise of B-cells, macrophages and dendritic cells in the lymph nodes. Once the S-protein antigen is presented at the cell surface of the MHC-II molecules, the naïve helper T-Cell's (Th Cells) T-cell Receptor (TCR) complex will interact with this antigen leading to activation of CD4+ Th cells. This activation is perpetuated by a secondary activation signal with B7 on the APC recognizing the CD28 on the Th cell which triggers the proliferation of Th cells that can recognize the S-protein antigen. Activated CD4+ Th cells then secrete numerous cytokines, namely Interleukin (IL)-2 which activates CD8+ cytotoxic T-cells (Tc cell) and trigger clonal expansion of B-cells in memory B-cells and plasma cells. The cytokines IL-4 and IL-5 facilitate B-cell isotype switching and maturation to plasma cells; promoting secretion of IgG antibodies against S-protein.[10] Formation of antibodies allows the immune system to direct an immune response against cells expressing the S-protein of the virus. The second process involves MHC-I, which activates CD8+ Naïve Tc cells through TCR complex interaction with processed endogenously synthesized S-protein expressed on MHC-I. MHC-I is expressed in all nucleated cells, APCs, and platelets and require a second activation signal provided by IL-2 from

activated CD4+ Th cells. This activates CD8+ Tc cells which can mount a cytotoxic response against SARS-CoV-2-infected cells through two mechanisms of apoptosis. The first mechanism is the secretion of perforin which create pores to allow granzyme to enter the targeted cell, thus activating apoptosis. The second mechanism is via the expression of FasL, which binds Fas on target cells and induces apoptosis.[10] A crucial part of this process is the stimulation of memory T-cells and memory B-cells. Importantly, while the SARS-CoV-2 vaccine's lasting effect is still being researched in the context of the pandemic, theoretically these should provide lasting immunity and allow the immune system to mount a faster and more effective response should a vaccinated individual encounter the virus in the future.

COVID-19 Vaccines

BioNTech/Pfizer

The BNT162b2 COVID-19 vaccine developed by BioNTech and Pfizer is a lipid nanoparticle-formulated, nucleoside-modified RNA vaccine that encodes a prefusion membrane-anchored SARS-CoV-2 full-length spike protein.[11] It was the first vaccine approved by the US Food and Drug Association (FDA) and now it has been approved in many other countries.[12] The BNT162b2 COVID-19 vaccine may be stored at standard refrigerator temperatures prior to use, but it requires very cold temperatures for long-term storage and shipping (-70°C) to maintain the stability of the lipid nanoparticle. In a phase-1 trial, it was compared to another vaccine candidate BNT162b1 and it was found to have a milder systemic side-effect profile with a similar antibody response.[13] Therefore, it was pushed forward to a blinded phase-2/3 clinical study.[11] In total, 43,548 participants were randomized to receive either two doses of the BNT162b2 vaccine (n=21,720) or a placebo (n=21,728) 21 days apart. The participant ages ranged from 16 to 91 years, 35.1% of participants were classified as having obesity and comorbidities within participants included HIV, malignancy, diabetes, and vascular diseases.[11] Based on the results of the study, 7 days after the second BNT162b2 dose, the VE was 95% (95% Confidence Interval (CI) 90.3-97.6) with only eight observed cases of COVID-19 in the vaccine recipients and 162 cases in the placebo recipients.[11] The efficacy remained consistent across subgroups characterized by age, sex, race, ethnicity, Body Mass Index (BMI) and comorbidities (Generally 90-100%).[11] Although there were 10 cases of severe COVID-19 with onset after the first dose, only one occurred in a vaccine recipient and nine in placebo recipients. Like the phase-1 trial results, the safety profile remained favorable with the most common local reaction being mild-to-moderate pain at the injection site while the most common systemic symptoms were fatigue and headache (Reported in ≥50%).[9] In both the vaccine and placebo group, the incidence of severe adverse events did not differ significantly (0.6% and 0.5%, respectively) and no deaths occurred related to the vaccine. As indicated by the manufacturer's information, contraindications for use include hypersensitivity to the active substance or any of the excipients.[14] These studies show that the mRNA-vaccine BNT162b2 is safe and effective in protecting against COVID-19.

Moderna

The mRNA-1273 vaccine, developed by Moderna, relies on mRNA technology to encode prefusion stabilized SARS-CoV-2 spike protein. It is the second COVID-19 vaccine to receive emergency use approval by the US FDA and it is given as two 100-µg doses intramuscularly into the deltoid muscle, 28 days apart.[15] Storage of the vaccine is done at temperature between -25°C to -15°C for long-term storage, 2°C to 8°C for 30 days, or 8°C to 25°C for up to 12 hours. Results from the COVE phase-3 trial showed that the mRNA-1273 vaccine was effective at preventing COVID-19 illness in persons 18 years of age or older. A total of 30,420 participants aged 18 years or older were randomized 1:1 to receive either two doses of the vaccine or a placebo, 28 days apart.[16] The mean age of the participants was 51.4 years and enrollment was adjusted for equal representation of racial and ethnic minorities. In the trial, symptomatic COVID-19 illness occurred in 11 participants within the vaccine group versus 185 participants within the placebo group, showing a 94.1% (95% CI, 89.3-96.8%) efficacy of the vaccine. Efficacy was similar across age, sex, race, and ethnicity as well as in patients with and without risk factors for severe disease (e.g. Chronic lung disease, cardiac disease and severe obesity). Importantly, a secondary endpoint for determining the efficacy of the vaccine in preventing severe COVID-19 was also used. All 30 participants with severe COVID-19 were in the placebo group, indicating a 100% efficacy of no hospital admission.[16] Regarding the side effects of the vaccine, adverse events at the injection site and systemic adverse events occurred more commonly with the mRNA-1273 group compared to the placebo. The most common local reaction was mild to moderate pain at the injection site (75%). The most common systemic symptoms were fatigue, myalgia, arthralgia and headache (50%).[16] The overall incidence of serious adverse events did not differ significantly between groups and no deaths occurred in relation to the vaccine. While this vaccine is already being administered, further investigations are still necessary to establish safety and efficacy profiles for populations not included in this study as well as to assess its long-term effects. Current contraindications of the mRNA-1273 vaccine include any persons with known allergy to Polyethylene Glycol (PEG) another mRNA vaccine component or polysorbate.[17]

AstraZeneca

The Oxford and AstraZeneca ChAdOx1 COVID-19 vaccine uses a chimpanzee adenovirus vector to deliver the genetic sequence of a full-length spike protein of SARS-CoV-2 into host cells.[18] The storage for the ChAdOx1 vaccine is favorable, as it may be refrigerated at 2°C-8°C for 6 months. Pooled analysis of four ongoing clinical studies was used to assess efficacy, safety, and immunogenicity of the ChAdOx1 vaccine: COV001 (Phase 1/2) COV002 (Phase 2/3), COV003 (Phase 3) and COV005 (Phase 1/2).[19] Across the four studies participants over 18 were randomized to receive either the vaccine or a control (Meningococcal group A, C, W or saline). ChAdOx1 vaccine recipients received two Standard Doses (SDs) of the vaccine (SD/SD cohort) except for a subset in the COV002 trial who received a half Lower Dose (LD) followed by an SD (LD/SD cohort).[19] In the four studies, there was a total 23,848 participants, all of whom were used for gathering safety data, only 11,636 participants from the COV002 and COV003 trials were included in the primary efficacy analysis.[19] Of the 11,636 participants in the efficacy analysis, 2741 were in the LD/SD cohort, 88% were between 18 and 55 years old, and comorbidities present included cardiovascular disease, respiratory disease and diabetes.[19] The results show that in the intended dosing regimen (SD/SD cohort) the VE was 62.1% (95% CI, 41.0-75.7) ≥14 days after the second injection for symptomatic COVID-19 (27 cases vs 71 cases respectively).[19] In the group that received an LD (LD/SD cohort) the VE was 90.0% (95% CI, 67.4-97.0, 3 cases vs 30 cases respectively) while across the two dosing regimens the overall efficacy was 70.4% (95.8% CI, 54.8-80.6, 30 cases vs 101 cases respectively).[19] The higher efficacy observed in the LD/SD cohort can be attributed to this group having a longer dosing interval between the two doses in comparison to the SD/SD cohort. Regarding safety, most of the adverse events were mild-moderate with the most frequently reported being injection site pain/tenderness, fatigue, headache, malaise and myalgia.[20] About 175 serious adverse events were noted, only three of which were possibly linked to intervention: transverse myelitis 14 days after second dose, haemolytic anemia in a control recipient and fever >40°C in a participant still masked to group allocation. One contraindication for use of the vaccine is hypersensitivity to any of its components. In very rare cases, AstraZeneca has been associated internationally with venous thromboembolic events with thrombocytopenia with current estimates being 10-15 cases per million vaccinated patients.[21] This adverse event has been termed thrombosis with Thrombocytopenia Syndrome (TTS).

Janssen COVID-19 Vaccine

The Janssen COVID-19 vaccine, developed by Janssen Pharmaceutical in Netherlands. It is a single-dose intramuscular (IM) vaccine that contains a recombinant, replication incompetent human adenovirus (Ad 26) vector encoding the spike protein of SARS-CoV-2 in the stabilized conformation.[22] It can be stored between 2°C and 8°C for up to 6 hours or at room temperature for a duration of 2 hours. The ENSEMBLE Phase-3 trial (n=43,783) was a randomized, double-blind, placebo-controlled study which included participants ≥18 years. Efficacy assessment was performed at day 14 and 28. The primary outcome only included moderate and severe (Hospitalization and death) infection. Overall, the VE in the moderate to severe cohort was 66.9% (95% CI: 59.0-73.4) at 14 days and 66.1% (95% CI: 55.0-74.8) at 28 days.[22] In the severe cohort, the VE was 76.7% (95% CI: 54.6-89.1) and 85.4% (95% CI: 54.2-96.9) at day 14 and 28 days, respectively.[20] At the time of the study, 96.4% of the strains in the United States, 96.4% were identified as the Wuhan-H1 variant D614G. The VE in the United States for the moderate to severe cohort was 74.4% (95% CI: 65.0-81.6) and 72.0% (95% CI: 58.2-81.7) at 14 days and 28 days respectively.[22] In the US severe cohort, the VE was 78.0% (95% CI: 33.1-94.6) and 85.9% (95% CI: -9.4 to 99.7) at day 14 and 28 days respectively.[22] Alternatively, 94.5% of the strains in South Africa were identified as beta variant. The VE in South Africa for the moderate to severe cohort was 52.0% (95% CI: 30.3-67.4) and 64.0% (95% CI: 41.2-78.7) at 14 days and 28 days, respectively.[22] In the South African severe cohort, the VE was 73.1% (95% CI: 40.0-89.4) and 81.7% (95% CI: 46.2-95.4) at day 14 and 28 days, respectively.[22] In Brazil, 69.4% of the strains were identified as P.2 lineage variant and 30.6% were identified as Wuhan-H1 variant D614G. The VE in Brazil for the moderate to severe cohort was 66.2% (95% CI: 51.0-77.1) and 68.1% (95% CI: 48.8-80.7) at 14 days and 28 days, respectively.[22] In the Brazilian severe cohort, the VE was 81.9% (95% CI: 17.0-98.1) and 87.6% (95% CI: 7.8-99.7) at day 14 and 28 days, respectively.[22] The most common localized solitary adverse reaction was the injection site pain (48.6%). Conversely, the most common systemic adverse reactions included headache, fatigue, myalgia and nausea.[22] In the post authorization phase, adverse reaction included anaphylaxis, thrombosis with thrombocytopenia, Guillain Barré syndrome, and capillary leak syndrome.[22] Overall, the data demonstrate that the Janssen vaccine has a good efficacy and side-effect profile.

Gamaleya

Sputnik V or Gam-COVID-Vac, developed by the Gamaleya Institute, is a recombinant human adenovirus-based vaccine that uses two different vectors (rAd26 and rAd5) to carry the gene encoding for the spike protein of SARS-CoV-2. Only one vector (rAd 26) is given at dose 1 and the other (rAd5) at dose 2. This strategy prevents immunity against the vector. It can be stored as either a liquid at -18°C or it can be freeze-dried and stored at 2°C to 8°C.[23] Regarding the safety and efficacy of the vaccine, both were evaluated in a randomized, double-blind phase-3

trial performed in Moscow, Russia. In the trial, a total of 21,977 participants aged 18 years or older were randomized in a 3:1 ratio to the vaccine or placebo groups. Two doses of the vaccine or placebo were given 21 days apart to the respective groups.[23] The mean age of the participants was 45.3 years and the majority of participants were Caucasian (98.5%).[23] From 21 days after the first dose of the vaccine, efficacy against symptomatic COVID-19 illness was 91.6% (95% CI, 85.6-95.2%) with 16 confirmed cases of COVID-19 in the vaccine group and 62 confirmed in the placebo group.[23] There were also 20 cases of moderate to severe COVID-19 infection confirmed in the placebo group at least 21 days after the first dose and 0 in the vaccine group, indicating a VE of 100% against moderate to severe infection.[23] The most common adverse effects in both groups were flu-like illness, injection site reactions, headaches, and asthenia, with the majority being grade 1 (94.0%).[23] Serious adverse events were also reported in both the vaccine group and placebo group, but they were deemed not to be associated with the vaccination.

SinoVac

CoronaVac is an inactivated vaccine developed by SinoVac Biotech containing inactivated SARS-CoV-2.[24] The vaccine can be stored at 2°C to 8°C for up to 3 years making it an attractive option for development. Two phase-1/2 clinical trials assessed the safety, tolerability, and immunogenicity of the CoronaVac vaccine.[24,25] The first study (18-59 years old included only) placed 744 participants in either a vaccine or placebo group where they were further divided based on vaccination schedule and dosage (3 and 6μg). In the second study (≥60 years old included only), 422 participants were randomized to receive two doses of CoronaVac or placebo 28 days apart and then further divided based on dosage amount only (3 and 6μg for phase 1; 1.5, 3 and 6μg for phase 2). Safety results from both trials show a favorable side-effect profile with most symptoms being transient and of mild severity. The most common adverse effect was injection site pain, others included fatigue and fever. In the 18-59 years old study, one serious adverse event of acute hypersensitivity was possibly related to vaccination.[24] No serious adverse events were associated with the vaccine or placebo in the ≥60-year-old study. Between the dosage amounts in both studies, the tolerability was consistent and the immunogenicity was also similar for the 3 and 6μg doses (Less in 1.5μg).[25] Multiple phase-3 trials have also taken place to determine the effectiveness of CoronaVac in countries, such as Brazil, Indonesia and Turkey. In the Brazil trial, 252 cases of COVID-19 were recorded from roughly 9200 health care workers, with 167 in the placebo group and 85 in the vaccine group.[26] The reported efficacy of the vaccine in preventing mild and severe COVID-19 infection was 50.4%. In comparison, the Turkey trial reported that the vaccine was 83.5% effective at preventing symptomatic infection based on 29 COVID-19 cases among 1,322 volunteers while results from the Indonesia trial found that the vaccine was 65.3% effective at preventing symptomatic infection based on 25 COVID-19 cases among 1,600 people.[26] Some reasons for the lower efficacy of CoronaVac in the Brazil trial may include increased likelihood of exposure to the virus since participants were healthcare workers and insufficient time for participants to reach peak immunity since the doses were administered only 2 weeks apart.[26] The phase-3 SinoVac study in Chile showed the VE 14 days post second dose to prevent symptomatic COVID-19 (67%, 95% CI: 65-69%), hospital admission (85%, 95% CI: 83-87%), Intensive Care Unit (ICU) admission (89%, 95% CI: 84-92%) and death (80%, 95% CI: 73-86%).[27] The Phase-3 SinoVac trial in Brazil showed an overall VE against symptomatic COVID-19 (50.7%, 95% CI: 35.9-62%), moderate cases requiring hospitalization (83.7%, 95% CI: 58-93.7%) and severe cases requiring hospitalization (100%, 95% CI: 56.4-100%).[28] As with any vaccine, a contraindication for CoronaVac is anaphylaxis to it or to one of its constituents.

In a nut shell - efficacy, dosing strategy, side effects and storage recommendations for prime COVID-19 vaccines are shown in Table I.

Table I Efficacy, dosing strategy and side-effects of different COVID-19 Vaccines

Company	Phase-III efficacy against non-variant COVID-19 strain % (95% CI)	Injection type	Pooled side effects across doses (% frequency, n)	Storage
BioNTech/Pfizer (Germany/USA)	**Dual dose:** 94.1% (89.8–97.6) at ≥35 days Single dose: 92.6% (69.0–98.3) between days 14–28	IM (2 doses)	**Phase-II trial results** 1. Injection site pain (80.6%, n = 3536) 2. Fatigue (53.1%, n = 2332) 3. Headache (46.6%, n = 2044) 4. Myalgia (28.9%, n = 1270) 5. Arthralgia (16.2%, n = 710) 6. Fever ≥38.0˚C (9.5%, n = 416) 7. Vomiting (1.5%, n = 68) * Data for 18–55 years old	(80.6%, n = 3536) -70˚C

Company	Phase-III efficacy against non-variant COVID-19 strain % (95% CI)	Injection type	Pooled side effects across doses (% frequency, n)	Storage
Moderna (USA)	**Dual dose:** 94.1% (89.3–96.8) at ≥ 42 days Single dose: 92.1% (68.8–99.1) between days 14–28	IM (2 doses)	**Phase-II trial results** 1. Pain at the injection site (92.0%, n = 13,970) 2. Fatigue (70.0%, n = 10,630) 3. Headache (64.7%, n = 9825) 4. Myalgia (61.5%, n = 9339) 5. Arthralgia (46.4%, n = 7046) 6. Chills (45.4%, n = 6894) 7. Nausea/vomiting (23.0%, n = 3493) 8. Axillary swelling (19.8%, n = 3007) 9. Fever (15.5%, n = 2354) 10. Injection site swelling (14.7%, n = 2232) 11. Injection site erythema (10.0%, n = 1519) * Data for ≥18 years old	-25˚C and -15˚C
AstraZeneca (UK)	**Dual dose:** 66.7% (57·4–74·0) at 104 days Single dose: 76% (59·3–85·9) between days 22–90	IM (2 doses)	**Phase-II trial results** 1. Pain at the injection site (63.7%, n = 7657) 2. Tenderness at the injection site (54.2%, n = 6515) 3. Fatigue (53.1%, n = 6383) 4. Headache (52.6%, n = 6323) 5. Malaise (44.2%, n = 5313) 6. Myalgia (44.0%, n = 5289) 7. Chills (31.9%, n = 3835) 8. Arthralgia (26.4%, n = 3174) 9. Fever ≥38.0˚C (7.9%, n = 950) *Data for ≥18 years old with at least one dose	2˚C–8˚C
Janssen (Netherlands/US)	**Single dose:** Symptomatic 66.3% (59.9–71.8) Hospitalization 93% (71–98)	IM (1 dose)	**Phase-I trial results** 1. Injection site pain 2. Fatigue 3. Headache 4. Myalgia 5. Nausea 6. Pyrexia * Data for 18–55 years old	2˚C–8˚C
Gamaleya Sputnik V Gam-COVID-Vac (Russia)	**Dual dose:** 91.6% (85.6–95.2) Single dose: 73.6% from 15–21 days	IM (2 doses)	**Pooled phase-I and phase-II trial results** 1. Hyperthermia (68%, n = 27) 2. Injection site pain (50%, n = 20) 3. Headache (40%, n = 16) 4. Asthenia (38%, n = 15) 5. Myalgia/arthralgia (28%, n = 11) 6. Rhinorrhoea (10%, n = 4) * Data for 18–60 years old	2˚C–8˚C
SinoVac (China)	**Dual dose:** Symptomatic: 50.7% Moderate hospitalization: 83.7% Severe hospitalization: 100%	IM (2 doses)	**Phase-II trial results** 1. Injection site pain (11.2%, n = 27) 2. Diarrhea (2.5%, n = 6) 3. Fever (2.0%, n = 5) 4. Fatigue (1.7%, n = 4) 5. Myalgia (1.3%, n = 3) 6. Headache (0.8%, n = 2) *Data for 18–59 years old, 3µg dose on days 0 and 14	2˚C–8˚C

Conclusion

It is imperative that people are vaccinated as quickly as possible until herd immunity can be achieved. One aspect of achieving this, in the face of vaccine hesitancy, is to address the lack of community understanding on how vaccines work, the risks, and the factors that keep this area of research volatile and distribution policies ever-changing. In addition, it is important to remain cautious about the information being released and to trust the accredited sources and experts, rather than the aberrant rumors being spread through social media and news portal. Every vaccine has advantages and disadvantages. Considering availability, affordability, storage facility, advantages and disadvantages vaccine should be chosen and administered.

Recommendation

The COVID-19 vaccines have shown to be highly promising and it recommend for everyone that is eligible to take the vaccine at the correct dosing interval when they are given the chance as this would potentiate a positive trend toward pandemic resolution.

Disclosure

The author declared no competing interest.

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