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## Contents

<b>Editorial</b> .....	<i>iv</i>
<b>Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks</b> <i>B. K. Tiwari</i> .....	<i>1</i>
<b>Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis</b> <i>Ashi Lama and Anup Kumar Das</i> .....	<i>16</i>
<b>Biominalization Potential of a Ureolytic Fungus Isolated From Mawsmi Cave in Meghalaya</b> <i>Nirmala Akoijam, Sunayana Dutta and S.R. Joshi</i> .....	<i>31</i>
<b>Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community</b> <i>Julian L. Roy Jyrwa, Anuradha Sathiyaseelan</i> .....	<i>50</i>
<b>Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup District, Assam, India</b> <i>Pinky Barua</i> .....	<i>65</i>
<b>Myth and Reality of Secularism in India: An Analysis</b> <i>Arun Kumar Singh</i> .....	<i>74</i>
<b>DECLARATION</b> <i>Form IV Rule 8</i> .....	<i>85</i>



## Editorial

### Dear Researchers and Readers

The Covid crisis has not given respite to human. The Covid second wave has been causing agony more than we could have imagined. The world especially our country is gripped under disaster brought about by the contagious virus. As the vaccines have been rolled out and people are getting vaccinated, we expect to get the infection curve flattened sooner than later and precious lives are protected. In the meantime, Covid appropriate behaviour is a must and we need to adhere to SOPs in days to come. Situation has come to a point when experts and citizens have been appealing to the social, electronic and print media to avoid airing negative news which is not only causing depression but also has shaken the willpower of everyone. Educational institutions which were opened for a short period after the first wave are closed again with academics activities are back to online platforms. Research activities involving laboratory bench work and data collection have been on a standstill. When the situation continues to look grim during the pandemic, researchers are seen remaining engaged and continue to submit their manuscript to journals and I express my sincere gratefulness for their contributions to our journal. I am extremely indebted to the reviewers for their time and valuable suggestions provided on the manuscripts. I am thankful to my editorial team for being there whenever I needed their help and assistance.

The present volume blends articles of multidisciplinary nature drawn from Life Sciences, Human & Environmental Sciences, Law and Social Sciences.

This volume begins with an article on **“Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills of Meghalaya: Developing Community Forest Networks”** by B. K. Tiwari. The author presents the scenario of forests of Meghalaya especially the ones managed through traditional institutions. These forests popularly known as community forests are experiencing pressure due to extraction of fuel wood and timber, grazing, and expansion of agriculture and human habitations. He

discusses on the urgent need to devise strategies and approaches to conserve these forests with an aim to enhance and sustain the economic and ecological benefits from the forests to the communities dependent on forest for their livelihoods.

Ashi Lama and Anup Kumar Das in their paper “**Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**” examine the factors affecting the incidence and the case fatality of Covid-19 at global level by using the cross sectional data from 79 countries. They suggest the need to develop peripheral areas to decongest population and provide better access to healthcare facility to people along with strengthening of healthcare workers to mitigate the impact of the pandemic

In their article “**Biom mineralization Potential of a Ureolytic Fungus isolated From Mawsm ai Cave in Meghalaya**”, Nirmala Akoijam, Sunayana Dutta and S.R. Joshi present a geomicrobiological studies on calcifying ureolytic fungi from the Mawsm ai cave in Meghalaya, India for their calcium biom mineralization efficacy. The fungus, *Aspergillus versicolor* as an ureolytic fungi isolated from the cave indicate the isolate could play an important role in biom mineralization.

Julian L. Roy Jyrwa and Anuradha Sathiyaseelan in their paper “**Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community**” present self-regulation as an important predictor of positive outcomes with the study attempting to gain an understanding into the perceptions of self-regulation among parents. It concludes that parents conceptualize self-regulation in children as motivated behaviour that is driven by having goal that is subservient to authority and is driven by factors such as temperament and the self-autonomous or independence that the child exerts.

In the article “**Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup, District, Assam, India**”, Pinky Barua reveals how covid19 virus had a severe impact on dairy farmers livelihood impacting their daily. The study was conducted in the Kamrup area of Assam

to find out the basic challenges encountered by the dairy farmers during first part of COVID19 lockdown days.

Arun Kumar Singh in his article “ **Myth and Reality of Secularism in India: An Analysis**” discusses on secularism and values of secular character interwoven in the constitutional fabric of India from the very beginning. He emphasizes that secularism is indeed one of the fundamental ideals of the Constitution and can never be changed. This paper attempts to understand the meaning and concept of secularism in India and its challenges.

I take this opportunity to thank the contributors for their submissions and the reviewers for their promptness in providing valuable comments. Suggestions and cooperation of the editorial members have always been a source of guidance and strength.

I make my sincere appeal to the scholars to submit/continue submitting manuscript(s) for publication in future issues of The NEHU Journal.

Stay Safe and Get Vaccinated for Covid-19

Prof. S.R. Joshi

Editor





## **Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks**

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### **Abstract:**

*More than three fourth of geographical area of Meghalaya is under forest cover. About 90% of forests of Meghalaya belong to communities who manage them through traditional institutions. These forests are popularly known as community forests. The forests of Meghalaya are experiencing pressure due to extraction of fuel wood and timber, grazing, and expansion of agriculture and human habitations. The pressure is maximum in Khasi Hills which covers about half of the geographical area and supports about half of the population of the state. The community forests have been classified into various categories depending on the quantum of restrictions imposed on extraction of forest produce. The most common types of community forests are: sacred forest (Law Kyntang, Law Lyngdoh, Law Niam), village restricted forest (Law Adong) and village supply forest (Law Shnong). Almost every village in Khasi Hills has a community forest of one or the other category. It has been reported that Khasi Hills is losing forest cover at a rapid rate and most of the forest cover loss is taking place in the community forests. Therefore, there is a genuine and urgent need to devise strategies and approaches to conserve these forests with an aim to enhance and sustain the economic and ecological benefits from the forests accruing to the people, particularly to the communities dependent on forest for their livelihoods. This paper proposes a sound strategy for conservation of community forests of Khasi Hills, Meghalaya by developing community forest networks.*

**Keywords:** *Meghalaya; Community forests; Sacred forests; Forest networks; Conservation.*

### **Introduction**

Forests are an important source of food, fibre, freshwater and construction materials for subsistence as well as cash income for the people of Meghalaya and act as ‘safety net’ in

times of hardship. For these reasons, communities dwelling in or near forests have in the past ensured that rich and diverse forest areas are preserved and protected. Close proximity to these resources and their constant utilisation have enabled traditional communities to develop an understanding of the conservation and sustainable utilisation of forests. This knowledge is expressed in the diverse cultural practices of the local people and forms part of their human heritage. About 90% of forests of Meghalaya belong to communities who manage it through traditional institutions using local knowledge and practices transmitted from generation to generation. The community institutions and forest management practices vary in different regions of the state viz., Khasi Hills, Garo Hills and Jaintia Hills (Tiwari, 2019). This paper relates to the Khasi Hills predominantly inhabited by people belonging to Khasi tribe and comprising of four districts of Meghalaya viz., East Khasi Hills, West Khasi Hills, South West Khasi Hills and Ri Bhoi. Khasi Hills occupies about half (11715 sq km) of the geographical area of Meghalaya. It is also inhabited by about half (1487166) of the population of the state. It is located in the central part of the state and covers three distinct land morphs viz., the Northern Slope predominantly covering the Ri Bhoi District, Central Plateau covering the districts of East Khasi Hills, West Khasi Hills, and South West Khasi Hills and Southern Slope in the southern part of East Khasi Hills bordering Bangladesh (Fig. 1).

**Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks**

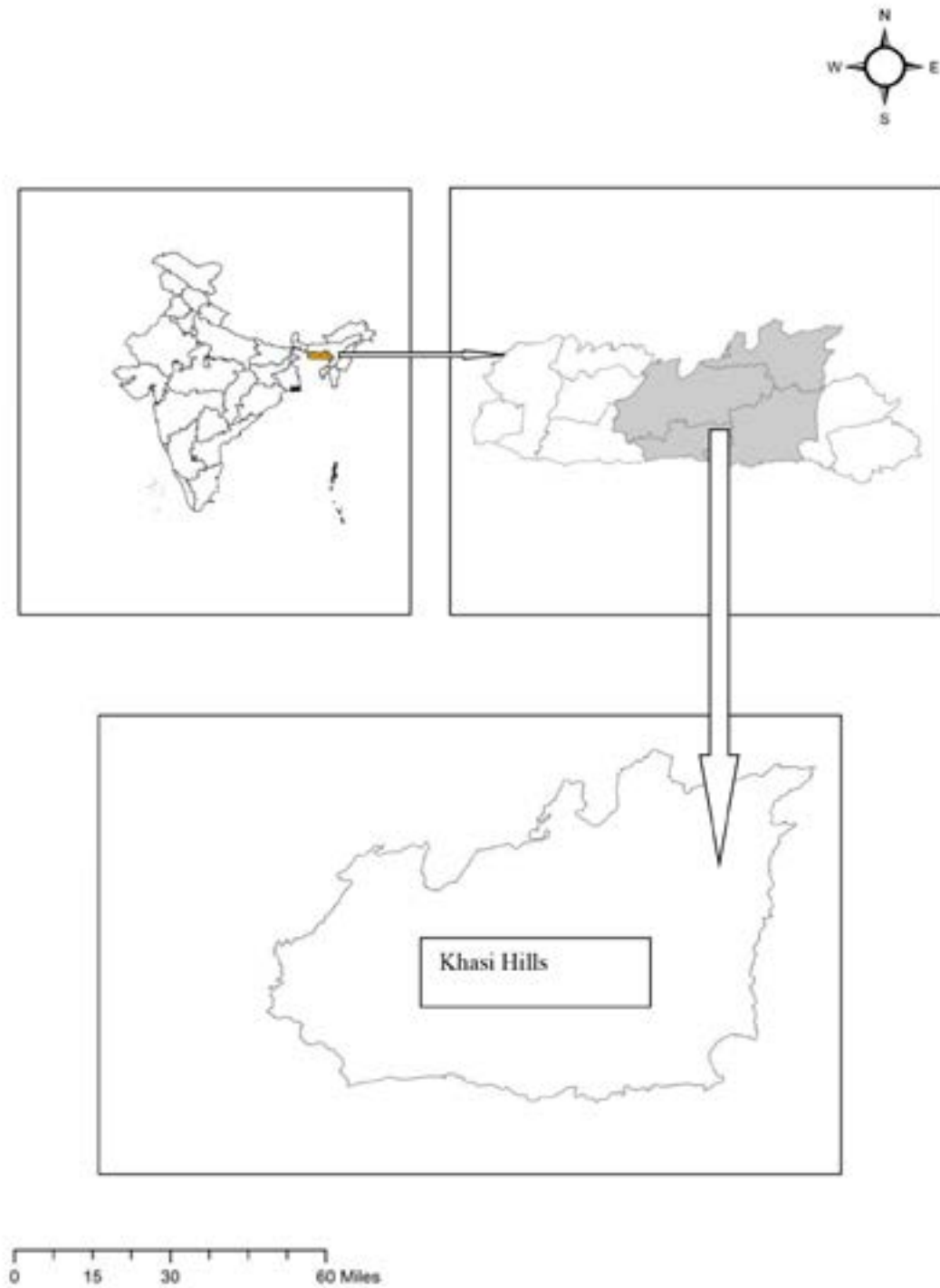


Fig 1. Map showing Khasi Hills, Meghalaya

Community forests (CFs) of Khasi Hills are of diverse types viz., sacred forest, village forest, raid forest, syiemship forest, clan forest, church forest, society forest, cemetery forest etc. Most of these forests are managed by traditional institutions (TIs) headed by Syiem, Sirdar, Wahdar, Lyngdoh, Rangbah Shnong, Rangbah Kur, Syiem Raid, etc. Khasi Hills Autonomous District Council (KHADC), a non-traditional institution, established under sixth schedule of Indian constitution, has administrative control over these traditional institutions and thus wields indirect control over the CFs. The KHADC also collects royalty and cess over the sale of forest products. The State Forest Department (SFD), Government of Meghalaya, also has significant stake in these forests, particularly for issuing transit permit and collection of taxes on the forest products sold outside the state. Few decades ago SFD took up the responsibility of regenerating degraded CFs through Joint Forest Management Committees (JFMCs) funded under National Afforestation Programme of Government of India. During past four decades the SFD and Soil and Water Conservation Department (SWCD) of the Government of Meghalaya have raised thousands of hectares of forest tree plantations on degraded CFs and erstwhile *jhum* lands; some of which have matured and the departments are in the process of handing them over to the local traditional institutions for management and control e.g. Hima Myllem Forest, Mawpat. Thus any action aimed at promoting community forest management (CFM) in four districts of Khasi Hills must associate all the three agencies viz., traditional institutions, KHADC and State Forest Department. There is ample scope of enhancing the level of cooperation among these institutions and there is a need to devise mechanism to enhance the cooperation among these institutions in the field of forest management in general and CFM in particular. Fifteen CFs of Khasi Hills have been declared as Community Reserves (CR) vide Section 36 C of the Wild Life (Protection) Act, 1972 through an agreement between the heads of traditional institutions and State Forest Department ([http://www.megforest.gov.in/wildlife\\_community.html](http://www.megforest.gov.in/wildlife_community.html)). This is a miniscule considering the number and area of forest under community control in Khasi Hills. Bringing all or even substantial number of CFs under CR, a type of protected area, may not be possible as this will restrict several usufruct rights of the communities and also put tremendous responsibility on the forest officials to oversee the enforcement of the provisions of Wildlife (Protection) Act 1972 in the CRs located in various parts of the region. Several of the CFs serve as source of land and building materials for construction of houses for newlywed couples belonging to poorer section of the society. CFs are source of NTFPs, fuelwood, fodder and serve as grazing land for livestock. CFs also provide timber and at times cash for building and or maintenance of community hall, churches, schools and other infrastructure in the village as decided by the Durbar. CFs are a common property resource and every resident of the village are proud owner of the community forest. Thus converting CFs into CRs will deprive the communities of their livelihoods and make them dependent on market for their day to day needs of forest products and services. It will not be out of context to say that CR is a borrowed concept superimposed over the Khasi people who already have a

## **Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks**

working model of community forest management (CFM) practised for centuries (Tiwari *et al.*, 2010; Oberlack *et al.*, 2015 ).

Mounting pressures from market forces and increasing aspirations of local people for improving their standards of living has commoditised the forests and thus the people are least interested in setting aside the forests for future or protecting forests without any tangible benefits accruing to them in short run. This has resulted in large-scale degradation of the CFs in Meghalaya. In most villages only the sacred forests (*Law Kyntang*, *Law Lyngdoh*, and *Law Niam*) and prohibited forests (*Law Adong*) harbour primary forests. In most parts of Khasi Hills the village forests (*Law Shnong*) where from extraction of fuel wood and timber for bonafied use is allowed, are no longer in good condition. In spite of presence of strong traditional institutions ‘tragedy of commons’ has come into play and during past fifty years or so large scale extraction of timber has resulted in depletion and degradation of CFs in the state. Illegal extraction of timber and its export to neighbouring state through informal trade is not very uncommon. Recent forest cover assessments have shown that the forest cover of Meghalaya in general and Khasi Hills in particular is on decline and within a span of two years 2017-2019, 121.48 sq.km forest cover of Khasi Hills has been lost (ISFR, 2019). Therefore, there is a genuine and urgent need to devise strategies and approaches to conserve these forests with an aim to enhance and sustain the economic and ecological benefits from the forests accruing to the people, particularly the communities dependent on forest for their livelihoods. A number of government and non-government agencies have been working for protection and regeneration of the forests of the state and several thousands of hectares of tree plantations have been created. However, this has made little positive impact towards conservation of CFs. Our study on the status of CFs in Meghalaya has revealed that lasting impact can be made if the communities recognise the need and develop their own local specific strategy for CFM (Oberlack *et al.*, 2015). The role of external agencies could be limited to sensitisation and motivation of the community leaders and sharing with them some experiences and technologies that have worked in similar situations elsewhere. In order to reach the communities and to deliver the services there is a need to develop an institutional network that can facilitate the process and help in percolation of ideas. Networking of CFs of the state may help a great deal in achieving the objective of conservation and sustainable management of forests of Meghalaya that will in turn help in poverty alleviation and sustainable economic and social development of the people of the state. The CF networks can provide a forum through which the government departments (e.g. SFD, SWCD), KHADC and non-government agencies can deliver services and implement forestry related programmes. In order to develop such networks following key activities need to be taken up.

## Key Activities

### Identify and sensitise the functionaries of traditional institutions

The first and foremost requirement for developing the network of community forest in East Khasi Hills, West Khasi Hills, South West Khasi Hills and Ri Bhoi districts of Meghalaya is to motivate and sensitise the TIs who control these forests at the local level. These institutions can be the *Rangbah Shnong* (Village headman) *Rangbah Dang* (Locality headman) and *Rangbah Kur* (Clan chief), as they are the local authorities and therefore they are in a better position to influence the decision of the families and individuals. However, the number of village level local authorities may run into thousands and therefore, it may not be feasible to work with all of them individually. So, it would be prudent to clump them in to groups/clusters of manageable size. A cluster of twenty to thirty villages should be good enough. It would be better if these village clusters have some organic linkage, for example, they may belong to same Sirdarship, Lyngdohship, Raid Syiemship or Wahdarship etc. In the four districts of Khasi Hills there are 16 Syiemships, 6 Sirdarships, 3 Lyngdohships, and 1 Wahdarship. The jurisdiction of Syiemships in few cases are generally very large covering thousands of square km area and as many number of villages. Therefore, working at the level of Syiemships particularly the ones like Myliem and Khyriem may not be feasible. Smaller and middle level TIs namely, Sirdarships, Lyngdohships, Raid Syiemships and Wahdarships, generally spread over 10-20 villages, are most appropriate for formation of networks. So first activity to be taken up is to procure where available or prepare where not available, the jurisdiction map of various middle level traditional institutions. Some middle level TIs have formed associations of village headman locally called as *Synjuk Rangbah Shnong*. The node of this network can be located at the headquarters of TI chief who may work as Community Facilitator/Coordinator (CF) for the area under his jurisdiction.

The hierarchy of Traditional Institutions differs in different parts of Khasi Hills. However, generally they can be one of following types:-

**Type 1.** *Khasi Hills Autonomous District Council* → *Syiem Hima* → *Syiem Raid* → *Rangbah Shnong* → *Rangbah Dong* → *Family* → *Individual*

**Type 2.** *Khasi Hills Autonomous District Council* → *Lyngdoh Hima* → *Rangbah Shnong* → *Rangbah Dong* → *Family* → *Individual*

**Type 3.** *Khasi Hills Autonomous District Council* → *Syiem Hima* → *Syiem Raid* → *Rangbah Shnong* → *Rangbah Kur* → *Family* → *Individual*

**Type 4.** *Khasi Hills Autonomous District Council* → *Sirdar/Wahdar* → *Rangbah Shnong* → *Rangbah Kur* → *Family* → *Individual*

## Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks

A typical hierarchy and relationship among traditional institutions in Khasi Hills is shown in the Fig.2.



Fig.2. Hierarchy and relationship among various traditional institutions of Khasi Hills, Meghalaya (Syiemlieh *et al.*, 2003).

### Identify a community leader

During the process of identifying and sensitising the traditional institutions, it is required to identify the community leaders (CL) having interest in development of society and village. The CL should be a volunteer not a paid employee. It has been seen that no sooner a social worker becomes a paid employee he (CL) loses his hold on the people and he is no longer able to take voluntary work from others in the society leading to erosion of his respect and authority. Community leader can work as functionary of the network who may keep the records and convene the meetings. The working of CF network shall depend to a large extent on the community facilitator (TI chief) and the community leader.

### Locate and classify community forests

Almost every Khasi village has a community forest of one or the other kind. Some villages



have two three types of community forests (Tynsong *et al.*, 2012). The institution involved in management of these forests and forestlands vary according to the type of forest (Table 1). With the help of local traditional institutions and by using remote sensing data and GIS techniques, it is possible to show the CFs of Khasi Hills on a map. The forests may be classified on the basis of their status of degradation or canopy cover also, as the strategy of their development will vary accordingly, for example the ones in good condition may need continuity of protection while the degraded one may involve efforts for regeneration as well as protection. Proximity and typological similarity may work as affiliating force for building networks. For example, it may be easier to construct a network of Sacred Forests (*Law Kyntang*). It may be interesting to explore possibility of forming networks of village forests (*Law Shnong*) and networks of prohibited forests (*Law Adong*) etc. Major community forests and chief functionaries of traditional institution/authority responsible for their management in Khasi Hills of Meghalaya are given in Table 1.

Table 1. Community forests and institution/authority responsible for their management

<b>Type of Community Forest</b>	<b>Chief functionary of Institution/authority responsible for management</b>
Sacred Forests	Lyngdoh, Rangbah Shnong, Rangbah Kur
Village Forests	Rangbah Shnong, Rangbah Dong
Raid Forest	Syiem Raid
Clan Forest	Rangbah Kur
Syiemship Forest	Syiem Hima

### **Demonstrate the goods and services provided by the CFs**

In modern world, traditional beliefs and education, awareness raising and capacity building alone may not help in conservation of CFs unless it is combined with the economic returns in short run. During a workshop organised by our group we have very clearly demonstrated the linkages of forest services (particularly water source protection) with the village forests (Tynsong *et al.*, 2012). This exercise was done by the villagers themselves and by the end of workshop the participants were very excited having discovered the dependence of a variety of user groups (e.g. urban water supplies, hydroelectricity production units, industries) on their forests, some of these user groups were located hundreds of kilometres away from their villages. Such exercises involving the communities may help in motivating the people for protection and management of CFs as they discover by themselves the services rendered by their forests. In some cases

## **Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks**

possibility of introducing collection of user fee may be explored which may provide benefit in short run to the communities conserving CFs. Being hill state water conservation service of CFs is likely to be most attractive to the people of Meghalaya (Tiwari, unpublished). Biodiversity conservation, climate amelioration, biological control of pests, and provisional services may be explained with suitable examples and locally available evidences. In several villages the villagers are experiencing the water scarcity and have begun to realise the value of CFs in protection of water sources. Through our field works we have observed that villagers consider forest stream water better for drinking than the water supplied by the taps installed by government. All the villages and CFs belonging to one watershed/catchment or clusters of CFs providing ecosystem services to one user group may form a network in order to take care of their interests jointly. Water resource map and its connectivity with the forests are depicted in Fig. 3 and Fig. 4. Pyngwait and Mynring villages have large area of community forests which are serving the water services of the downstream villages. It is seen that most streams originate in the forests at upstream and join the rivers in the valleys downstream. Villages located downstream are dependent on the upstream villages for their water supply. It is likely that the rivers supplying water to downstream may dry up or may become seasonal if the upstream forests are degraded. This further demonstrates and emphasises on the need of some sort of networking and dialogue among upstream and downstream villages for sustainable management of forests.

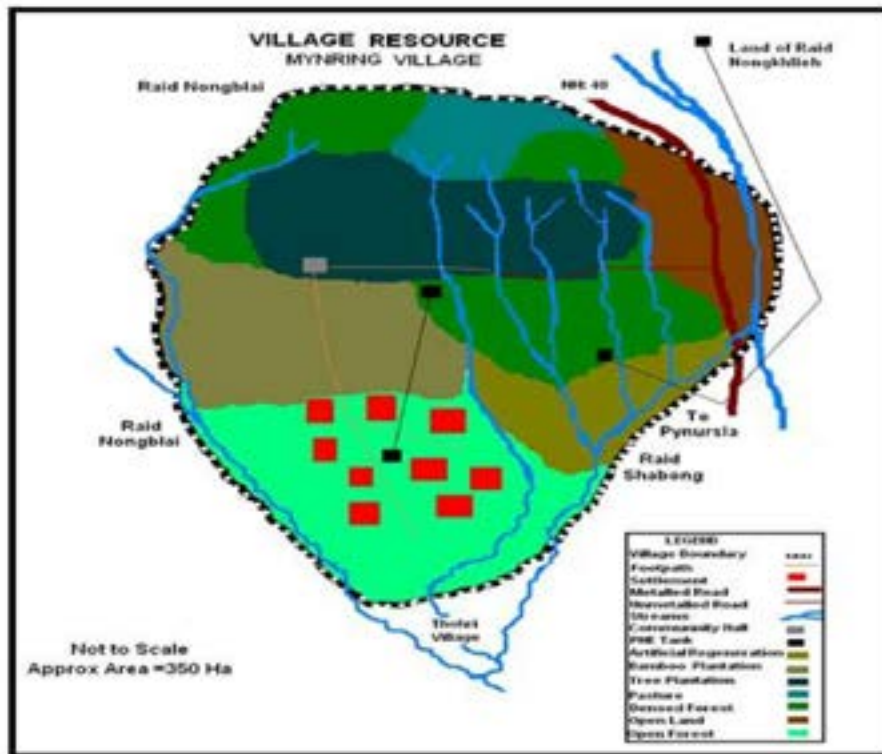


Fig. 3. Water Resource map of Pyngwait village showing its connectivity with forests

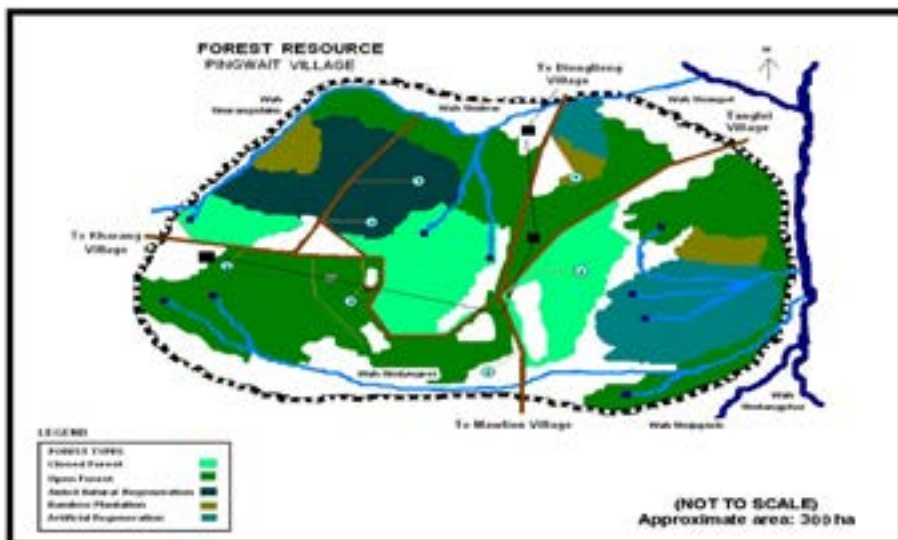


Fig. 4. Water Resource map of Mynring and Pyngwait village showing its connectivity with forests

## **Institutionalising the Networks**

It has been observed time and again that the networks breakdown if they are not supported by an institutional framework. In case of CF network the organisational support is already in existence in the form of TIs. The concept of CF network needs to be strengthened/assimilated in the working of these organisations. Newly created institutions like JFMCs, Village Employment Councils (VEC) and Watershed Development Committees may also be involved in networking of the CFs. The CF networks can be made sustainable by promoting periodic interactions among the members where they can discuss common issues relating to conservation of CFs such as policy changes, government support, land use at the landscape level and conflict resolutions. It is important that the people understand the value of interdependence of the CFs and people at large. This can be demonstrated by undertaking simple exercises on spatial information relating to cumulative impact of the CFs at landscape level in enhancing the ecosystem services provided by the forests. In Khasi Hills there are several CFs on the hills whose adjoining valleys support fertile lands where paddy is cultivated. The close linkages between the CFs, soil fertility, soil moisture of agricultural lands and quality and quantity of water in the streams running through the valleys needs to be explained to the communities. This can be done by drawing resource map as shown in Fig. 3 and Fig. 4.

## **Sharing experiences and dissemination of success stories**

The first one or two networks may need support and interventions. It is desirable to see that the sites selected for initial networking should be such that chances of success are more as we cannot afford to fail. If we are able to demonstrate a working CF network at one site, subsequent networks of CFs shall propagate by themselves or will need minimal efforts. In order to achieve this, the financial input should be kept to minimum. Once this is achieved it may be desirable to facilitate sharing of experiences and dissemination of success stories in order to accelerate the spread of networking.

## **Linking of TIs with the Government**

Government departments invariably approach village level TIs before taking up any development work in the village. However, the disbursement of finances to the TIs is never done. The major hurdle in this regard is general non-existence of accounting and audit procedures in the working of the TIs. The other factors that come in way of formal involvement of TIs is their semi-democratic character, large scale structural and functional variability, absence of codified legislations and non-participation of women in village durbars/decision making. One way to find solution to this problem is to analyse the approaches and experiences of other agencies in tackling similar situations. For example: Nagaland was also faced with somewhat similar challenge, which they have been able to tackle by establishing Village Development Boards which works as interface between the

TIs and government. In IFAD project villages of Meghalaya, this issue has been tackled by establishing Natural Resource Management Groups in each project village. In Mawphlang village of EK Hills district of Meghalaya the villagers had established a Forest Regeneration Committee for implementation of North-Eastern Council funded project. From these examples it is clear that it is possible to link the TIs with the Government and it is happening wherever need arises.

### **Structure and Functioning of CF Networks**

The structure of the CF network shall be local specific. However, broadly, as stated earlier its jurisdiction should be the village included in the middle level TI of the area. The network should work under overall guidance of the Chief of the TI who shall be assisted by the community leader identified for the purpose. All the headmen of the area shall be member of the network. All the CFs situated in the area covered by the network shall be identified and their regeneration and protection shall be the primary task of the network. The network shall share their experiences and resources (managerial skill, propagules/planting materials, social fencing etc) among themselves through formal and informal meetings. The network can become a pressure group for collective bargaining for funds and resources from government and international agencies like Carbon Fund or GEF grants. The network can identify/develop a pool of knowledgeable persons who can serve as trainer and motivator for CFM.

### **Steps to develop community-based networks**

The next step to develop community-based network should be to demonstrate to the people about the benefits of the forests. This should be done through village level participatory planning workshops at various levels. At level 1: the village leaders like executive members of village durbar and village elders may be motivated who in turn can take the message to common people. The TIs are already linked with the Khasi Hills Autonomous District Council (KHADC) though Sixth Schedule of Constitution of India. At present KHADC is not in a position to provide any technical or financial assistance to the TIs. Once several networks are in place they can be federated at the level of Syiemship, the highest level of TI. Even before this happens, it will be helpful if the Syiem Myllem and Syiem Khyriem, under whose jurisdiction a large chunk of East Khasi Hills and Ri Bhoi districts falls, are informed and taken into confidence about the activity and their cooperation is ensured for furthering the cause.

### **Who should take the Responsibility?**

The task will need a great deal of interdepartmental coordination and therefore in my opinion the Meghalaya Basin Development Authority (MBDA) should be in a better position to take the responsibility. The MBDA may like to assign the task to The World Bank supported Meghalaya Community-led Landscape Management Project (CLLMP)

## **Strategies and Approaches for Enhancing Conservation of Community Forests in Khasi Hills, of Meghalaya: Developing Community Forest Networks**

who can take a lead in this activity. The project has a reach to the rural areas and has man power and material resources for undertaking the task. The project staff may be supported by Village Level Workers (VLWs) and other grassroots level government officials who may help in organising the meetings and in collection of data concerning forests and people of the villages.

### **Bench marks of Achievements**

Some indicators of success of development of CF network are: 1. High level of interaction among the network members as evident by formal or informal meetings held. 2. Regeneration of CFs or at least arresting of their degradation 3. Replication of networking in neighbouring areas. If these indicators are observed on the ground, the objective of CF networking has been achieved.

### **Conclusion and Summary**

In conclusion, it can be said that Developing Community Forest Network (CFN) can be a potent strategy for conservation of community forests in places where they are under the control and management of traditional institutions like Khasi Hills of Meghalaya. The process of development of the network shall include documentation of CFs and associated TIs, selecting right size of network, motivating the personnel of TIs, capacity building of local leaders, institutionalising the networks, linking them with higher level of TIs, creating platform for constant interaction among network members and linking the networks with the state and national governments and where necessary with international agencies.

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## **Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**

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### **Abstract**

*This paper examines the factors affecting the incidence and the case fatality of Covid-19 at global level by using the cross sectional data from 79 countries. The data were collected from the websites of World Health Organization and World Bank. The data were analysed by applying the descriptive statistical methods, box plot and logistic regression. The analysis of data showed that there were wide inter-country variation in incidence and fatality of Covid-19. The regression results showed that incidence was positively associated with population density and human development index. However, fatality rate was negatively associated with population in younger age group and number of doctors. The study implies that there is a need to develop peripheral areas to decongest population and provide better access to healthcare facility to elderly people along with strengthening of healthcare workers to mitigate the impact of the pandemic.*

**Keywords:** Covid-19, Global analysis, Incidence, Fatality, Logistic regression, Healthcare facility

### **Introduction**

The pandemic of novel coronavirus (Covid-19) has created global health crisis and has threatened the human population in the entire world. The virus which causes a severe acute respiratory syndrome (SARS) disease in human being is considered to one of most dangerous threats to mankind as it is highly contagious and there is no specific medicine to cure from it. The Covid-19 was first discovered in a seafood market in Wuhan city of Hubei province, China in 2019. It is believed to have been transmitted to human being from animals (bat) but its zoonotic source is unknown (WHO, March 2020). In order to combat the spread of virus, China adopted the stringent measure of lockdown and quarantine of infected persons. However, it could not check the spread of virus to other countries (Yaylali, 2020). The virus spread rapidly to other countries through international air traffic (Suryawanshi, 2020). Since the global economy has a high degree of integration, the virus spread to almost all the countries of the world within a short span of time (Harilal, 2020). By the end of July, 2020, it had affected more than 200 countries as movement of

## **Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**

people was not halted by many countries in a highly integrated world. The World Health Organization considered Covid-19 as the worst health crisis being faced by the human being and declared it as the global pandemic on 11 March, 2020 (Williamson *et al.*, 2020). In fact, it is the worst crisis being faced by mankind since World War-II and it can lead to instability and unrest in the world (The Economic Times, April 1, 2020). The world has been witnessing the pandemic after more than 100 years of the Great Influenza (popularly known as Spanish flu) of 1918 (Lama *et al.*, 2020). Though the infection of virus started in Asia, the worst affected countries are those in Europe and Americas. The total infected cases worldwide rose rapidly to 17.106 million as on 31<sup>st</sup> July, 2020. The virus has been highly fatal as it has killed 0.668 million people worldwide as on 31<sup>st</sup> July, 2020 (Situation Report-193, WHO). The global fatality rate of the covid-19 was 4.02 per cent. The virus is considered to be highly fatal to elderly people and those with comorbidities as most of the deceased were in the age group of above 64 years. As per the WHO report, the worst affected countries as on 31<sup>st</sup> July, 2020 are United States of America (4.388 million confirmed cases), Brazil (2.552 million cases), India (1.64 million cases), Russia (0.839 million cases) and South Africa (0.422 million cases). The elderly people are considered to be the most vulnerable population group (Daoust, 2020). The virus has been unfair to elderly people as over 90 per cent of deaths were accounted for by people of over 60 years of age with comorbidities such as cardiovascular disease, diabetes, or respiratory illness (Kluge, 2020). In addition, weaker immune system of older people makes it difficult for them to fight the virus infection.

In order to contain the spread of the virus, different countries implemented different measures and imposed lockdown at different times. The lockdown measures mainly included prohibition of large-scale gatherings, social distancing, complete close down of offices and business establishment, transport services etc. In fact, quarantine and self-isolation have become the dominant form of social life in several countries. In many countries, curfews were imposed, allowing people to access public space only for the most urgent needs (Low and Knoblauch, 2020). The measures were aimed to protect people from getting infected and break its chain of spread. Italy announced the national lockdown on 9<sup>th</sup> March, 2020, Spain on the 14<sup>th</sup> March, 2020, France on the 17<sup>th</sup> March 2020, Germany on the 22<sup>nd</sup> of March, 2020 (Yaylali, 2020). India imposed nationwide lockdown from mid night of 24<sup>th</sup> March, 2020 which continued up to 31<sup>st</sup> May, 2020. The other measures include strengthening of healthcare facilities, quarantine of infected persons, hand washing, social distancing and public awareness. These measures must have slowed down the rate of transmission, but the spread of the virus could be fully contained as the effectiveness of the measures depended on timing and their obey by the population. Further, the lockdown measures adopted to contain the virus had severe economic implications as it led to fall in consumption and obstructed supply chain processes and laying off of workers. It reduced business activities, increased unemployment and also reduced GDP. Many countries recorded negative growth of GDP. India has suffered GDP decline of 34 per cent in the first two quarters of 2020. According to International Monetary Fund, global economic growth is forecasted to be -3 per cent in 2020 (Gopinath, 2020). The

world trade in goods is projected to decline by 13 % to 32 % in 2020 (WTO, 2020). The pandemic has created economic crisis almost same magnitude of 2008-09 financial crisis (Fernandes, 2020) and caused economic hardship to poor, wage earners, migrant workers and contractual employees.

Since the cases and deaths from Covid-19 are increasing and the data show wide variation in incidence and fatality of Covid-19 across the countries, it is important to analyse the factors that affect the incidence and fatality rate of Covid-19 at global level. While some countries have recorded very high incidence of the pandemic, others have registered low incidence. Similarly, there is a wide disparity among the countries in terms of fatality of Covid-19. Further, it has been observed that there is a weak link between incidence and fatality as the countries with high incidence of the pandemic have relatively low fatality. Since, the incidence and fatality of the pandemic are increasing at the global level and most of the countries are finding it hard to tackle the menace of the pandemic, there is a need to identify the factors which are affecting the incidence and fatality of Covid-19 at the global level. There are some studies which have analysed the determinants of incidence and mortality of Covid-19. For instance, Yaylali (2020) assessed the factors affecting Covid-19 cases and death rate in German States. The study reported that sex ratio, population density and disposable income were crucial for the number of cases. The death rate was influenced by number of cases, sex ratio, disposable income, average age. Williamson *et al.* (2020) assessed the risk of severe outcomes of population from Covid-19 by creating a secure health analytical platform (OpenSAFELY). The study showed that Covid-19 related death was associated with being male, greater age, deprivation, diabetes, severe asthma. It also showed that Black and South Asian people were at higher risk as compared to white ethnicity. Jeet *et. al.* (2020) explored the role of important factors affecting incidence and mortality of Covid-19 using data from 97 countries. The study showed significant inter-country variation in incidence and mortality rates of Covid-19. The incidence was found to be associated with testing rate, elderly population, population below poverty line, UHC index and fatality rate was associated with testing rate, population density, and elderly population. Mukherji (2020) uncovered socio-economic and health/lifestyle factors that can explain the differential impact of the Covid-19 pandemic on different parts of the United States. The study developed vulnerability index for US counties and found that counties with high median income have a high incidence of the cases but reported lower deaths. International airports were found to be positively affecting the incidence. Health risks factors were found to be significant in explaining differences in mortality across counties. Countries with better health care were found to have lower deaths. But the countries with higher pollution were found to have higher deaths from the virus. Suryawanshi *et al.* (2020) examined the factors influencing Covid-19 cases and deaths by taking data from 48 districts of India. The study found positive association of Covid-19 case burden with population density and negative correlation of case fatality rate with health index, human development index, per capita expenditure on health. The study suggested for decongestion of cities and stricter

## **Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**

measures in districts with international airports. Lama and Mitra (2021) examined the determinants of inter-State variation in incidence and fatality of Covid-19 in India by using the State level cross-sectional data. The ordinary least square method was applied to estimate the regression model and obtain the results.. The study showed that India had relatively low incidence of the disease. The Western region of the country was found to be worst affected by the pandemic. Among the States, incidence was the highest in Delhi and Maharashtra. But fatality was the highest in Maharashtra, Punjab and Madhya Pradesh. The results showed that incidence was positively affected by population density and international exposure and fatality was found to be negatively influenced by health care infrastructure.

The review of literatures showed that there are is a lack of studies which have comprehensively analysed the factors determining the incidence and fatality rate of Covid-19 at the global level. In this background, the paper is an attempt to analyse the factors which are playing crucial role in determining incidence and fatality rate of Covid-19 at the global level. The findings of the study can serve as a useful guide for the policy makers of various countries to deal with the pandemic and take appropriate measures reorganize the institutions to reduce both incidence and fatality of the pandemic.

### **Data Source**

The study is solely based on secondary sources of data. It is based on cross sectional data collected for 79 countries which had ten thousand and more confirmed cases of Covid-19 as on July 31, 2020. The data on confirmed cases and deaths from Covid-19 were collected from the website of World Health Organization (WHO). The data on population density, per capita income, human development index, age composition of population, international tourist arrivals, health workers, health infrastructure and healthcare expenditure were collected from the website of World Bank. The data were analysed by using the descriptive statistical methods, box plots and regression analysis.

### **Analytical Framework**

The incidence of Covid-19 was calculated as the number of confirmed cases per million population. On the other hand, the fatality of Covid-19 was calculated as the number of deceased per 1000 confirmed cases. In order to examine the factors influencing the incidence and the fatality of Covid-19 at global level, regression analysis was applied. The incidence of Covid-19 was taken to be a function of population density, per capita income, international tourist arrivals, human development index. While fatality was taken to be a function of per capita income, age group, health workers (doctors), health infrastructure (hospital beds) and healthcare expenditure.

Since the dependent variables (incidence and fatality) are in ratios and their values range between 0 and 1, a linear regression model would not be suitable as it would give spurious results. In such as a case, logistic regression model is the suitable one. Hence, logistic regression model was applied to examine the incidence of Covid-19 across the countries.

## Results and Discussion

### Incidence and Fatality of Covid-19 at Global Level

The analysis of incidence of Covid-19 across the countries shows that as on July 31, 2020, incidence of the pandemic was the highest in Qatar (39,003 cases per million population) followed by Bahrain, Chile, Oman and Kuwait. Table 1 presents the top ten countries in terms of cases per million population. The United States which had the highest number of confirmed cases (4.388 million cases as on July 31, 2020) and was listed at number seven in terms of incidence of the pandemic. Interestingly, China, where the pandemic started the first, recorded the lowest incidence of Covid-19 (63 per million population) among the 79 countries. It implied that China's strategy of strict lockdown and quarantine had been quite fruitful in combating the pandemic. This indicates that the governance also matters a lot in dealing with the emergency situation like pandemic.

Table 1: Top Ten Countries in terms of Incidence of Covid-19 Cases (As on 31<sup>st</sup> July 2020)

Countries	Population 2019	Confirmed cases	Incidence (cases per million population)
Qatar	2832067	110460	39003
Bahrain	1641172	40755	24833
Chile	18952038	353536	18654
Oman	4974986	79159	15911
Kuwait	4207083	66529	15814
Panama	4246439	63269	14899
United States	328239523	4388566	13370
Armenia	2957731	38550	13034
Peru	32510453	400683	12325
Brazil	211049527	2552265	12093

Source: WHO

**Factors Affecting Incidence and Fatality of Covid-19 Pandemic:  
A Cross-Country Analysis**

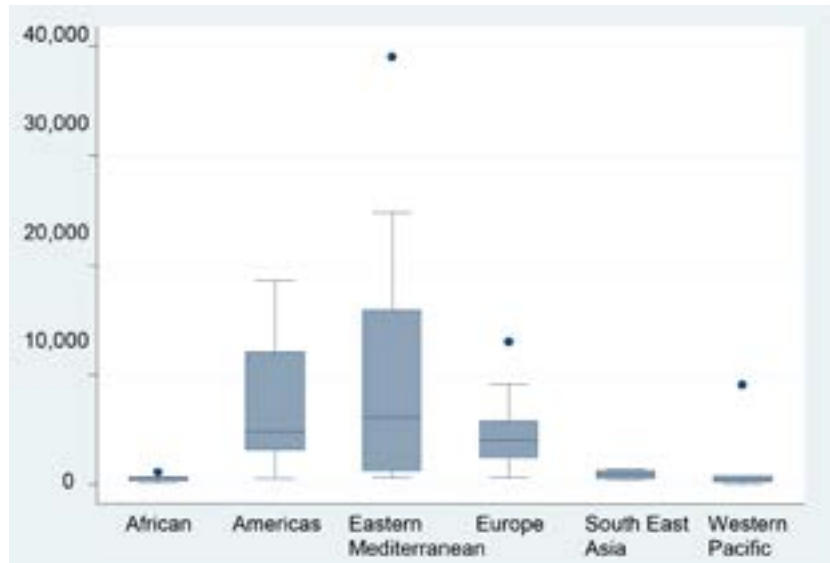
Table 2 and Figure 1 depict a great extent of variation in the incidence of Covid-19 across regions of the world. The regional analysis of the incidence of Covid-19 revealed that Eastern Mediterranean region had the highest incidence of Covid-19 with mean incidence of 9272 per million population (Table 2).

Table 2: Descriptive Statistics of Region wise Incidence of Covid-19 (As on 31<sup>st</sup> July, 2020)

Regions	Min.	Max	Mean	Std. Deviation
Eastern Medi- terranean	269	39003	9272	11734.01
Americas	602	18654	6955.06	5235.54
Europe	702	13034	4387.42	2648.17
Western Pa- cific	63	9084	1861	3549.4
African	148	8234	1312.6	2448.74
South East Asia	393	1441	929	477.09

Source: WHO

However, the region also had the highest standard deviation of incidence, which implied that there was a wide variation within the region. It was followed by Americas (with mean incidence of 6955 per million population) with standard deviation of 5235.54. Among the various regions, the incidence of Covid-19 was the lowest in South East Asia (929 cases per million population) and African region (1312.60 per million population). These regions also had the lowest standard deviation of incidence of the pandemic. It implied that relatively underdeveloped regions of the world were least affected by the pandemic. This could be attributed to poor transport and communication networks and scattered distribution of population in remote villages in the countries of these two regions.



Source: WHO

Figure 1: Region-wise Incidence of Covid-19 (Per million population)

The analysis of data on fatality of Covid-19 across the countries showed that France had the highest fatality (172.55 deceased per 1000 cases) followed by the United Kingdom, Belgium and Italy. Among the 179 countries, fatality was the lowest in Singapore (0.52 deceased per 1000 cases) Qatar (1.55 deceased per 1000 cases), Ukraine (2.42 deceased per 1000 cases and Nepal (2.66 deceased per 1000 cases). The fatality of Covid-19 in top ten countries is presented in Table 3.

Table 3: Top Ten Countries in terms of Fatality of Covid-19 (As on 31<sup>st</sup> July 2020)

Countries	Confirmed cases	Total deceased	Fatality rate (per 1000 cases)
France	174648	30136	172.55
The United Kingdom	302305	45999	152.16
Belgium	67913	9840	144.89
Italy	247158	35132	142.14
Netherlands	53963	6147	113.91
Mexico	408449	45361	111.06
Spain	285430	28443	99.65
Canada	115470	8917	77.22
Sweden	80100	5739	71.65
Ireland	26027	1763	67.74

Source: WHO



**Factors Affecting Incidence and Fatality of Covid-19 Pandemic:  
A Cross-Country Analysis**

The region wise fatality of Covid-19 is presented in table 4 and figure 2<sup>1</sup>. The table 4 shows that Europe region had the highest fatality of Covid-19 with mean of 51.09 deceased per 1000 cases. It was followed by Americas with mean fatality of 37.69 deceased per 1000 cases. The high fatality of Covid-19 in Europe and Americas, despite having superior healthcare facilities and high per capita income, could be attributed to their ageing population and comorbidities. Covid-19 was reported to be biased towards old people as most of the deceased were in the age group of 65 and above. The fatality of Covid-19 was the lowest in African (17.30 deceased per 1000 cases) and South East Asian (21.29 deceased per 1000 cases) regions. The low fatality of Covid-19 in African and South East Asia, despite having relatively inadequate healthcare facilities and low per capita income, could be attributed to large proportion of younger population who usually have better immunity, low level of pollution and organic food habit of the people. The standard deviation of fatality of Covid-19 was the highest in Europe and the lowest in African region.

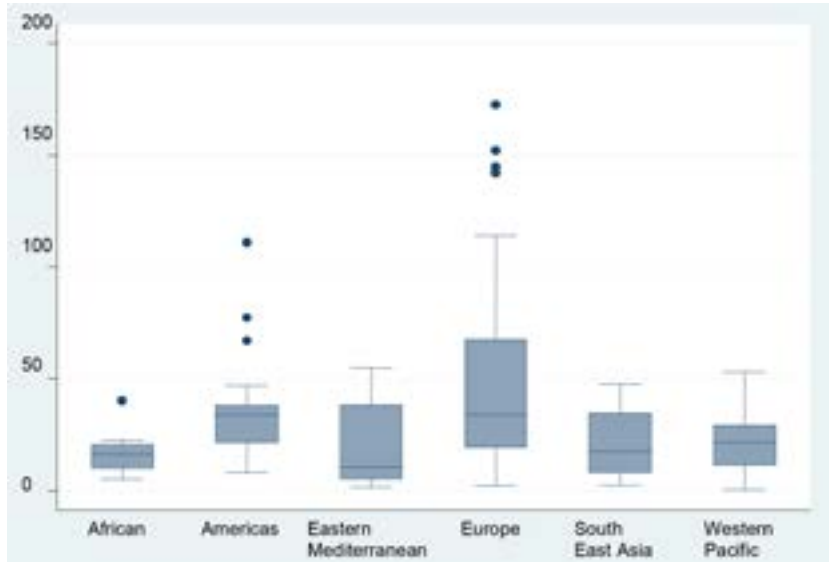
Table 4: Descriptive Statistics of Region wise Fatality of Covid-19 (As on 31<sup>st</sup> July, 2020)

Regions	Min.	Max	Mean	Std. Deviation
Europe	2.42	172.55	51.09	47.33
Americas	7.92	111.06	37.69	26.19
Eastern Mediterranean	1.55	63.07	23.99	21.81
Western Pacific	0.52	53.05	22.94	17.79
South East Asia	2.66	47.57	21.29	19.19
African	4.98	40.23	17.3	10.04

<sup>1</sup> Includes 78 sample countries.

Source: WHO





Source: WHO

Figure 2: Region-wise Fatality of Covid-19 (Per 1000 cases)

### ***Determinants of Incidence and Fatality of Covid-19 Pandemic***

In order to examine the factors influencing incidence and fatality of Covid-19 across the countries, the incidence of Covid-19 (IOC) was defined and calculated as the ratio of confirmed cases to the total population of the country. The fatality of Covid-19 (FOC) was calculated as the ratio of deceased to the confirmed cases. The value of both the dependent variables – IOC and FOC – lies between 0 and 1. Hence, logistic specification of the model will be suitable over the simple linear regression model. Accordingly logistic specification of regression for both the dependent variables has been formulated. The baseline regression models for IOC and FOC are:

$$IOC = \frac{1}{1 + e^{-Z}} \dots \dots \dots (1)$$

Where,  $Z = \beta_0 + \beta_1 PD + \beta_2 PG + \beta_3 TA + \beta_4 HDI + \beta_5 R_1 + \beta_6 R_1 + \beta_7 R_1 + \beta_8 R_1 + \beta_9 R_1 + U$  and

$$FOC = \frac{1}{1 + e^{-Z}} \dots \dots \dots (2)$$

Where,  $Z = \beta_1 PG + \beta_2 AG + \beta_3 AD + \beta_4 AB + \beta_5 HE + \beta_7 R_1 + \beta_8 R_1 + \beta_9 R_1 + \beta_{10} R_1 + \beta_{11} R_1 + U$  and

Equation (1) and (2) can be linearised as:

$$L_{IOC} = \ln\left(\frac{IOC}{1-IOC}\right) = \beta_0 + \beta_1 PD + \beta_2 PG + \beta_3 TA + \beta_4 HDI + \beta_5 R_1 + \beta_6 R_1 + \beta_7 R_1 + \beta_8 R_1 + \beta_9 R_1 + U \dots \dots \dots (3)$$

And,

$$L_{FOC} = \ln\left(\frac{FOC}{1-FOC}\right) = \beta_0 + \beta_1 PG + \beta_2 AG + \beta_3 AD + \beta_4 AB + \beta_5 HE + \beta_7 R_1 + \beta_8 R_1 + \beta_9 R_1 + \beta_{10} R_1 + \beta_{11} R_1 + U \dots \dots \dots (4)$$

# **Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**

As the data set was cross section in nature, Breusch-Pagan test was carried out; results confirmed the absence of the problem of heteroscedasticity with respect to both the formulations. The average and maximum values of VIF in both regression models were also found to be less than 10, and hence, multicollinearity was also not a serious issue. The details of explanatory variables with expected sign are presented in Table 5.

Table 5: Details of explanatory variables

Variable	Notation	Definition	Expected impact	
			IOC	FOC
Population density	PD	People per sq. km of land area	+	NA
Per capita GDP	PG	GDP per capita is gross domestic product divided by midyear population	+	+
Tourist arrival	TA	Arrival of international tourist per thousand	+	NA
Human development index	HDI	Value of HDI	+	NA
Age Group	AG	Percentage of population in age 15-64 years	NA	-
Availability of doctors	AD	Physicians per 1,000 people	NA	-
Availability of beds in hospital	AB	Hospital beds per 1,000 people	NA	-
Health expenditure	HE	Current health expenditure as a per cent of GDP	NA	-
Regional dummy	Five dummies have been used	R1 = 1 if Africa, 0 otherwise	+/-	+/-
		R2 = 1 if Americas, 0 otherwise		
		R3 = 1 if Eastern Mediterranean, 0 otherwise		
		R4 = 1 if Europe , 0 otherwise		
		R5 = 1 if South East Asia , 0 otherwise & Western Pacific is the reference region		

The results of the regression analysis<sup>2</sup> for the determinants of the incidence and fatality of Covid-19 are presented in Table 6.

<sup>2</sup> Based on the availability of data, 78 countries are considered for the regression analysis.

Table 6: Regression Results for Incidence and Fatality of Covid-19

Variable	Incidence			Fatality		
	Coef.	Std. Err.	P>t	Coef.	Std. Err.	P>t
Population density (PD)	0.00043***	0.00011	0.00000	-	-	-
Per capita GDP (PG)	0.00000	0.00001	0.95200	-0.000001	0.000006	0.879000
Tourist arrival (TA)	-0.00005	0.00020	0.79200	-	-	-
Human development index (HDI)	3.23968**	1.33794	0.01800	-	-	-
Age group (AG)	-	-	-	-0.0781***	0.026055	0.004000
Availability of doctors (AD)	-	-	-	-0.110308	0.114073	0.337000
Availability of beds in hospital (AB)	-	-	-	0.013407	0.046131	0.772000
Health expenditure (HE)	-	-	-	0.156084***	0.055021	0.006000
R1	1.43699***	0.53764	0.00900	-0.551781	0.680146	0.420000
R2	3.34565***	0.42811	0.00000	0.593790	0.548183	0.283000
R3	3.20671***	0.43870	0.00000	0.474948	0.518571	0.363000
R4	2.65616***	0.38867	0.00000	0.807524*	0.477005	0.095000
R5	1.67262***	0.57929	0.00500	0.330340	0.705742	0.641000
Constant	-11.05644***	1.11785	0.00000	0.089755	1.914044	0.963000
F			14.55(9,68)***			4.73 (10, 69)***
R-squared			0.6582			0.4138
Adjusted R-squared			0.613			0.3263

Source: WHO & World Bank

Note: \*\*\*, \*\* & \* represents significance at 1 per cent, 5 per cent and 10 per cent respectively

In () degrees of freedom

## **Factors Affecting Incidence and Fatality of Covid-19 Pandemic: A Cross-Country Analysis**

The results of regression for incidence of Covid-19 indicated that population density (PD) had a positive impact on incidence of Covid-19 cases and the coefficient of this variable was significant at 1 per cent level of significance. It shows that the incidence of Covid-19 was significantly more in the countries with higher density of population. Hence, there is a need to strictly implementation of social distancing measures in the countries with high population density. The variable human development index (HDI) was also found to be positively affecting the incidence of Covid-19 cases which coefficient was significant at 5 per cent level of significance. It indicates that the incidence of Covid-19 is high among the countries with higher development. This could be due to the fact that most of the countries which are suffering the worst from Covid-19 are the developed countries of Europe and Americas. Since the Covid-19 is highly contagious, greater mobility of people due to higher level of development might have increased the incidence of Covid-19 cases in those countries. The region wise analysis of incidence of Covid-19 showed that Eastern Mediterranean, Americas and Europe had the higher incidence as compared to Western Pacific, African and Asian regions. The variable like per capita GDP and tourist arrivals (TA) were not found to be significant factors. All the regional dummies were also found to be significant which confirmed the significant variation in the incidence of Covid-19 across regions.

Regarding the factors determining fatality of Covid-19, it was found that the coefficient of variable age group was negative and significant at 1 per cent level of significance. It implies that countries which are having higher proportion of population in age group of 15-64 years have lower fatality rate of Covid-19. This was expected as the Covid-19 was reported to be biased and fatal to older people. The coefficient of variable health expenditure (HE) was positive and significant at 1 per cent level of significance which was opposed to our expectation. This could be due to the fact that most of the countries with higher per capita health expenditure are the countries of Europe and Americas. These are also the countries witnessing higher fatality of Covid-19. The variables doctors (per 1000 population), hospital beds (per 1000 population) were also not significant revealing the absence of any impact on the fatality of Covid-19. The coefficient of regional dummy  $R_4$  (Europe region) was found to be positive and significant. It implies that as compared to other regions, fatality was significantly higher in Europe region.

### **Conclusion**

The entire world has been deeply affected by Covid-19 pandemic. The pandemic has paralysed the normal life across the globe and has created one of the worst global health crisis. It has infected millions of people and has been highly fatal to elderly people and to those with comorbidities. The incidence of Covid-19 was found to vary widely across the countries. The incidence was higher in Eastern Mediterranean, Americas and Europe. The fatality of Covid-19 was found to be higher in Europe and Americas. Both incidence and fatality of Covid-19 were lower in African and South East Asian regions. This implies that

relatively less developed parts of the world are least affected by the pandemic. This could be due to inadequate availability of transport infrastructure as studies have showed that incidence of the pandemic was positively affected by international airports and number of travelers. The relatively low fatality rate of Covid-19 in countries of African and South Asian regions can be attributed to organic food habits of the people and relatively lower level of air pollution. The regression analysis which was carried out to identify the factors affecting incidence and fatality of Covid-19 at global level showed that incidence was positively affected by population density and human development index (HDI) indicating that densely populated countries and countries with high HDI are likely to suffer higher incidence of the pandemic. On the other hand, case fatality of Covid-19 was negatively affected by proportion of population in the age group of 15-64 years and number of doctors per thousand population. However, it was positively affected by health expenditure as percentage of gross domestic product. Further, fatality was found to be positively associated with Europe region which indicated that this region had the higher fatality as compared to other regions. The findings of the study showed that there is a need for strict implementation of social distancing measures in areas with high concentration of population. At the same time, measures must be adopted to develop peripheral areas to decongest population in urban centres. It indicates that there is a need to adopt measures to reduce population growth as a long term strategy. The study shows that to reduce case fatality rate, elderly people should be given proper attention and access to better healthcare facilities. Further, health infrastructure, particularly, health workers must be strengthened to minimise the fatality rate.

### **Declaration of Conflict of Interest**

The author(s) declared no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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**Factors Affecting Incidence and Fatality of Covid-19 Pandemic:  
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## **Biomining Potential of a Ureolytic Fungus Isolated From Mawsmai Cave in Meghalaya**

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### **Abstract**

*Meghalaya is home to numerous caves of which many are still undiscovered. Geomicrobiological studies so far have focused on the bacterial composition and diversity of these caves. The present study was undertaken to isolate calcifying ureolytic fungi from the Mawsmai cave in Meghalaya, India for their calcium biomineralization efficacy. Out of 77 isolates, 25 were selected based on microscopic observations. In addition, 5 isolates that tested positive for urease were undertaken to further test for biomineralization potential. The isolate UF3 showed highest removal of  $\text{Ca}^{2+}$  when grown in liquid media supplemented with different calcium salts (calcium chloride, calcium nitrate and calcium oxalate). The medium supplemented with calcium chloride showed highest production of fungal biomass. A similar trend was observed for the fungal isolate UF3 showing better  $\text{Ca}^{2+}$  precipitation in agar and low soluble  $\text{Ca}^{2+}$  in liquid media. Upon phylogenetic analysis, the isolate UF3 showed high similarity with *Aspergillus versicolor*. The findings of this preliminary study on the ureolytic fungi isolated from Mawsmai cave suggest that the isolate UF3 could play an important role in biomineralization.*

**Keywords:** Cave, Fungi, Urease, *Aspergillus versicolor*, Biomineralization.

### **Introduction**

Humankind from the early times have depended on caves for shelter and even expression of art (Valladas *et al.*, 2001). Gillieson (1996) defined a cave as “any natural space below the earth’s surface that extends beyond the twilight zone, and is accessible to humans”. The behavior of seeking shelter in caves has been observed in other animal species as well (Chelini *et al.*, 2011; Fišer *et al.*, 2019). The subterranean environment harbors a variety of organisms ranging from microscopic bacteria and fungi to organisms with regressive evolution of optical morphological features owing to the low light environment of caves (Tobler *et al.*, 2009; Pérez-Moreno *et al.*, 2018; Stern *et al.*, 2018). Caves are exemplary sites serving as natural and experimental systems for fundamental geomicrobiological studies because of the easy accessibility (Barton and Northup, 2007). Geomicrobiological interactions in the cave environment influence microbial diversity and their activities that contribute to calcium carbonate ( $\text{CaCO}_3$ ) precipitation (Boquet *et al.*, 1973; Buczynski



and Chafetz, 1991).

Based on the process of formation, caves can be of many types. The most common type of caves, known as karst caves are formed by chemical dissolution of the host rock consisting of dissolvable minerals, namely calcite, dolomite, gypsum and rock salt (Lauritzen, 2018). Across the world, carbonate karst is the most common type followed by gypsum karst (formed by evaporation of calcium sulphate deposits on the land surface) (Ford and Williams, 2007).

Due to lack of light in the cave environment, carbohydrate synthesis that would usually occur by photosynthesis is restricted resulting in limitation of resources (Sarbu *et al.*, 1996). This would make the cave environment extremely unfavourable for any living organism to survive. However, cave ecosystems have adapted to deriving energy from organic matter brought in by allochthonous sources (percolating water, wind, bats or birds, etc.) (Simon *et al.*, 2003). Microorganisms are key players in mediating energy transfer between organic sources and the subterranean environment influencing biogeochemical cycles via metabolic pathways that convert minerals into bioavailable forms for use by other organisms (Simon *et al.*, 2007). Furthermore, microbes are known to regulate precipitation of carbonates in various natural environments, which induce formation of cave geological structures such as stalactites, stalagmites and cave wall deposits (Zhu and Dittrich, 2016).

Extensive study of minerals like  $\text{CaCO}_3$  formed by the process of biomineralization is necessary due to the significant contribution of these minerals to the global biogeochemical cycles (Van Cappellen, 2003). Microbial biomineralization has been discussed widely with much focus on prokaryotic (particularly bacteria) metabolic processes (Rusznýák *et al.*, 2011). However, several studies report that fungi are responsible in shaping biogeochemical cycles and help in biomineralization (Oggerin *et al.*, 2014; Dhami *et al.*, 2017; Pasquale *et al.*, 2019). Fungi are also responsible for organic matter recycling, mineral weathering and production of organic acids such as oxalic acid leading to formation of various metal-oxalate complexes (Gadd, 1999; Hoffland *et al.*, 2004). Furthermore, fungi can influence  $\text{Ca}^{2+}$  concentrations, either directly or indirectly. Fungal hyphae require  $\text{Ca}^{2+}$  in high concentrations for their apical growth but concentration of free  $\text{Ca}^{2+}$  in the cytoplasm is much lesser. To maintain this gradient, fungi either sequester the  $\text{Ca}^{2+}$  in organelles (mitochondria or endoplasmic reticulum) or pump it out of the cell or bind it to calmodulins ( $\text{Ca}^{2+}$ -binding protein) (Pitt and Ugalde, 1984). Fungal cell wall components like chitin and glycoproteins as well as secreted exopolymeric substances (EPS) can adsorb  $\text{Ca}^{2+}$  thereby initiating  $\text{CaCO}_3$  nucleation and subsequent organo-mineralization (Manoli *et al.*, 1997). Li *et al.* (2014) confirmed that urease-positive fungi could induce  $\text{CaCO}_3$  biomineralization similar to ureolytic bacteria. In another study, Li *et al.* (2015), isolated fungi from calcareous soils, suggesting that ureolytic fungi present in these environments may contribute to  $\text{CaCO}_3$  formation/stability. This is an important aspect of biomineralization since transformation of urea into ammonium leads to pH increase,

## **Biom mineralization Potential of a Ureolytic Fungus Isolated From Mawsmmai Cave in Meghalaya**

which is one of the important factors for  $\text{CaCO}_3$  precipitation (Korchef and Touaibi, 2019). Cave microbiology is an interdisciplinary field of microbiology, geology and chemistry that studies microorganisms in caves and their various influences on cave processes. The recognition of microorganisms (bacteria, in particular) in geological processes in caves has been noteworthy in our understanding of the cave ecosystems (Barton and Jurado, 2007). With various literature available to prove that fungi contribute to the formation of cave structures, its study may unveil different dimensions related to geomicrobiology. In this context, the present study was proposed to isolate and characterize fungi from a cave, Krem Mawsmmai (Krem translates to “cave” in the local language) located in the Khasi Hills, Meghalaya. Furthermore, the fungal isolates were studied for their calcification potential under *in vitro* conditions to relate to the process of biomineralization.

### **Study area and Geology**

Meghalaya is blessed with diverse natural wonders like caves. In 2016, a group of cave explorers in the East Khasi Hills district of Meghalaya discovered Krem Puri, the longest (8,269 m) sandstone caves in India (Kharpran-Daly, 2016). Other caves found in Meghalaya are Krem Mawsmmai, Krem Phyllut, Krem Mawpun, Krem Mawmluh, Krem Liat Prah, Krem Umthloo, Tetengkil Balwakol and Siju–Dobhakhoh.

Meghalaya Plateau is a northeastern extension of the Indian Peninsular Shield, with an elevation of 600–1800 m. The cave investigated in this study is located in the East Khasi Hills (N 25814.680 ; E 91843.480), bounded by Ri-Bhoi District on the North, Karbi Anglong district of Assam on the North-East, Jaintia Hills district on the East, Bangladesh on the South and West Khasi Hills district on the West (Ghosh *et al.*, 2005). With huge deposits of limestone and abundant rainfall, Meghalaya has abundant Karst cave formations. The limestone band runs from the West Garo Hills in the west through the West Khasi Hills, East Khasi Hills and into the Jaintia Hills in the east. The limestone deposits in the East Khasi Hills are located in the Mawmluh-Mawsmmai Hills south of lower Sohra extending to about 1.40 km area. The deposit is made up of limestone in the upper part and dolomite in the lower part (Harries *et al.*, 2008).

Krem Mawsmmai is located at a distance of around 6 km from Sohra and is surrounded by thickly forested zone. The cave is 160 m long, 15 m high and 4–10 m wide and is completely aphotic with an abundance of stalactites and stalagmites. The moist environment and the dense canopy cover makes the cave a suitable shelter for certain species.

India has a large number of unexplored caves and few caves in Meghalaya are among the largest mapped caves across the world. These caves have so far not attracted scientific attention with reference to microbial diversity and fungi in particular. The present study was therefore aimed at isolation and characterization of fungi from Mawsmmai cave located in East Khasi hills, Meghalaya (India) and to study various parameters that test their biomineralization (BIM) efficacy.

## **Methodology**

### **Sampling**

Samples were taken from minimally contaminated (undisturbed by human/anthropogenic activities) areas of the Mawsmi cave and were collected using sterile disposable gloves, forceps, spatula and autoclaved sampling bottles. Samples were collected from multiple sites within the cave which include lime deposits inside the cave, middle cave substratum, stony rock surface, water flowing inside the cave, cave exit, sandy substratum in the cave and forest soil. The samples were stored at 4°C until analyzed.

### **Isolation of fungi**

1 gram (soil sample) and 1 ml (water sample) was measured and added to 9 ml of 0.85% (w/v) sterile physiological saline and vortexed vigorously to make a uniform suspension followed by successive dilutions. Medium used for fungal isolation was Potato Dextrose Agar (PDA) (infusion from potatoes 200 gL<sup>-1</sup>, dextrose 20 gL<sup>-1</sup>, agar 15 gL<sup>-1</sup> (HiMedia, India). The PDA plates (supplemented with chloramphenicol) were inoculated with aliquots of 100 µl from the suspension dilutions of 10<sup>-2</sup>, 10<sup>-3</sup> and 10<sup>-4</sup>. All plates were incubated at 28°C for 7 days and subcultures were made from resultant colonies.

### **Staining using Lactophenol Cotton Blue Stain**

The fungal cultures were stained using Lactophenol cotton blue and observed under a bright-field microscope.

### **Urease Test for Selection of Ureolytic Fungi**

Christensen Urea agar media (peptone 1 gL<sup>-1</sup>, dextrose 1 gL<sup>-1</sup>, sodium chloride 5 gL<sup>-1</sup>, disodium hydrogen phosphate 1.2 gL<sup>-1</sup>, potassium dihydrogen phosphate 0.8 gL<sup>-1</sup>, phenol red 0.012 gL<sup>-1</sup>, agar 15 gL<sup>-1</sup>) (HiMedia) is used for this test. Phenol red acts as a pH indicator where the hydrolysis of urea produces ammonia with an increase in pH resulting in colour change of media from yellow to bright pink. 2% urea (membrane sterilised) is then added to the sterilized media before pouring into the glass vials aseptically. The slants after solidifying were inoculated with pure isolated fungal cultures and incubated at 28°C in an incubator for a day and observed for any colour change.

### **Biomass Estimation in different Calcium Salts**

For biomass estimation, the fungal cultures were grown in Potato Dextrose Broth (PDB) media supplemented with different calcium salts (100 mM calcium chloride, 100 mM calcium oxalate, 100 mM calcium nitrate) separately. Membrane-sterilized 2% urea was then added to the sterilized PDB media. Fungal cultures were inoculated into the media in aseptic conditions (laminar air flow chamber) and incubated in a shaker incubator at 30 °C for 7 days. After 14 days, the fungal biomass was separated from the broth by filtering it through Whatman filter paper no. 1. The biomass was transferred onto pre-weighed petri plates and weight was taken which accounts for the wet weight of the biomass. The

## **Biomining Potential of a Ureolytic Fungus Isolated From Mawmai Cave in Meghalaya**

biomass was dried and the weight was taken again which accounts for the dry weight. The difference between wet weight and dry weight gives the actual weight of the biomass.

### **Calcium Precipitation Efficacy**

Malt Extract Agar (MEA) medium (malt extract 20 gL<sup>-1</sup>, agar 15 gL<sup>-1</sup>) (HiMedia, India), 2% urea supplemented with 100 mM calcium chloride. Membrane-sterilized 2% urea was then added to the sterilized MEA medium. The MEA plates were inoculated with pure isolated ureolytic fungal cultures, incubated at 28°C and checked for calcium precipitation efficacy after 5 days.

### **Soluble Calcium Estimation**

The method of determining calcium is by EDTA titration method described in Stocks-Fischer *et al.* (1999). AP1 medium was used to grow the fungal cultures. Membrane-sterilized 2% urea was then added to the sterilized AP1 medium prepared as per the protocol of Li *et al.* (2015). The fungal cultures were then inoculated in the medium and incubated in a shaker incubator at 30 °C for 14 days.

### **Molecular Characterization and Phylogenetic Tree Analysis**

Genomic DNA of the fungal isolates was isolated by using the HiPurA™ Fungal DNA Purification Kit followed by amplification of the Internal Transcribed Spacer (ITS) regions of fungal ribosomal DNA (rDNA) using the universal primers ITS1-F [5'-CTT GGT CAT TTA GAG GAA GTA A-3'] and ITS4-R [3'-CAG ACT T(G/A)T A(C/T)A TGG TCC AG-3'] to amplify the highly variable ITS1 and ITS2 sequences. The amplification was performed at a volume of 50 µL comprising 10 mM Tris-HCl, 50 mM KCl, 1.5 mM MgCl<sub>2</sub>, 0.25 mM each of deoxynucleoside triphosphates (dATP, dCTP, dGTP, and dTTP), 0.2 µM primers, 0.25 µL of 3 U/ILTaq DNA polymerase (Bangalore Genei, India), and 3 µL of the template DNA (approximately 100 ng). The reaction parameters were denaturation for 5 min at 94°C, followed by 35 cycles consisting of denaturation for 1 min at 94°C, annealing at 55°C for 1 min, elongation at 72°C for 2 min and cycling was completed by a final elongation step for 5 min at 72 °C. A control tube containing sterile water was used as a negative control. The pure amplified samples of the fungal ITS sequences were then sent to the Macrogen for sequencing (Seoul, South Korea). The sequencing results were compared using the Basic Local Alignment Search Tool (BLAST) program on NCBI and ITS gene sequence homology analysis was done using GenBank data. A phylogenetic tree was constructed using the neighbor-joining model of the MEGA 6.0 program.

## Results and Findings

**Isolation of fungi:** The total number of pure fungal isolates obtained after plating on potato dextrose agar (PDA) media from each site is presented in Table 1.

**Table 1: Isolates obtained from different sample sites from Mawsmai cave**

Serial no.	Sample site	Number of pure isolates
1	Lime deposits inside cave	5
2	Middle cave substratum	22
3	Stony rock surface	9
4	Water flowing inside cave	7
5	Forest soil	12
6	Cave exit	17
7	Sandy substratum inside cave	5
Total isolates		77

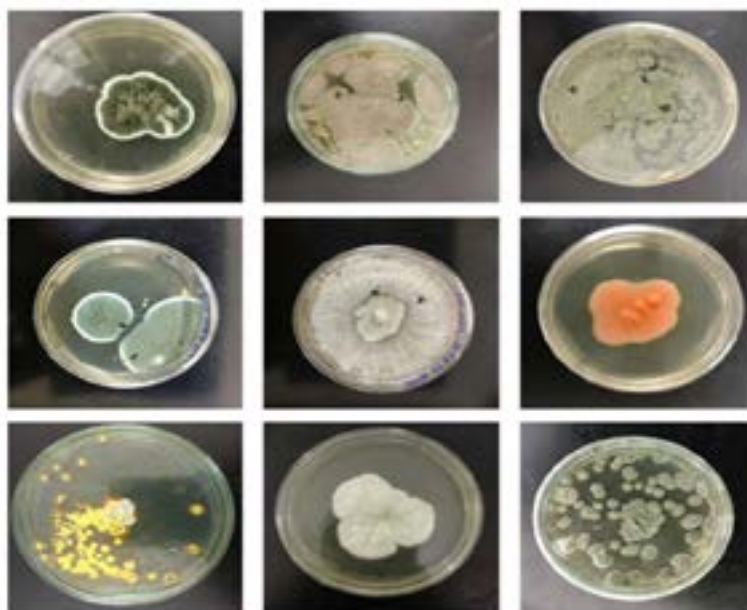


Fig. 1. Fungi isolated from Mawsmai cave

## Biomining Potential of a Ureolytic Fungus Isolated From Mawsmai Cave in Meghalaya

### Fungal Staining using Lactophenol Cotton Blue Stain

The pure fungal isolates were stained using lactophenol cotton blue stain to study their characteristic morphology such as shape, size and arrangement of spores and hyphae. Upon staining and observation under the microscope the following genera of fungi were notably observed – *Aspergillus*, *Penicillium* and *Mucor*. Among the 77 fungi isolated, 25 isolates were subsequently selected based on differences in morphological characteristics observed under light microscope.

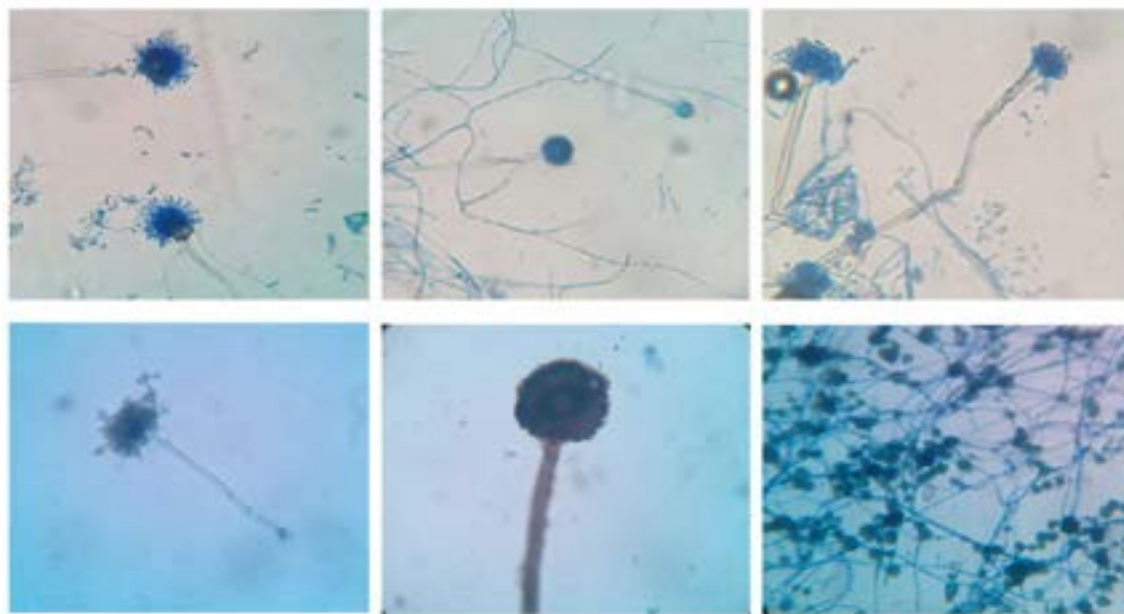


Fig. 2. Fungal isolates at 40X magnification

### Urease Test for Selection of Ureolytic Fungi

After incubation in the isolation media, around 77 fungi were isolated amongst which 25 strains were subsequently shortlisted based on differences in morphological characteristics observed by light microscopy. Upon selection in urea media, 5 isolates (UF1, UF2, UF3, UF4 and UF5) displayed ureolytic activity based upon formation of pink colour. These cultures were then further investigated for calcification potential.



Fig. 3. Ureolytic fungi using Christensen Urea Agar media



## Biomass Estimation Using Different Calcium Salts

As varying calcium sources have been reported to significantly affect microbial growth, the effect of different commonly used calcium sources (calcium chloride, calcium nitrate and calcium oxalate) on fungal biomass was investigated.

Table 2: Wet weight of fungal biomass in different calcium sources

Isolates	Weight of centrifuge tube (gm) (a)	Weight of centrifuge tube + wet fungal Bio-mass (gm) (a)	Wet Weight (gm) (b - a)
For Calcium Chloride			
UF1	16.66	18.51	1.85
UF2	16.32	16.11	2.79
UF3	15.50	17.40	1.9
UF4	15.51	16.97	1.46
UF5	15.95	17.13	1.18
For Calcium Nitrate			
UF1	14.28	16.47	2.19
UF2	15.56	16.72	1.16
UF3	14.40	15.72	1.32
UF4	14.45	19.10	4.65
UF5	No growth was observed		
For Calcium Oxalate			
UF1	16.67	18.92	2.25
UF2	16.18	17.51	1.33
UF3	15.18	16.16	0.98
UF4	15.84	17.13	1.29
UF5	15.96	16.64	0.68

**Biom mineralization Potential of a Ureolytic Fungus Isolated From  
Mawsm ai Cave in Meghalaya**

Table 3: Dry weight of fungal biomass in different calcium sources

Isolates	Weight of centrifuge tube (gm) (a)	Weight of centrifuge tube + wet fungal Bio-mass (gm) (b)	Wet Weight (gm) (b - a)
For Calcium Chloride			
UF1	16.66	17.06	0.4
UF2	15.32	16.58	1.26
UF3	15.50	15.93	0.43
UF4	15.51	16.49	0.98
UF5	15.95	16.68	0.73
For Calcium Nitrate			
UF1	14.28	15.73	1.45
UF2	15.56	16.20	0.64
UF3	14.40	14.89	0.49
UF4	14.45	18.69	4.24
UF5	No growth was observed		
For Calcium Oxalate			
UF1	16.67	18.15	1.48
UF2	16.18	16.98	0.8
UF3	15.18	15.58	0.4
UF4	15.84	16.60	0.76
UF5	15.96	16.16	0.2



Table 4: Actual weight of fungal biomass in different calcium sources

Isolates	Wet weight (gm)	Dry weight (gm)	Actual weight (Wet weight - Dry weight) (gm)	% Biomass Ca <sup>2+</sup> up-take (Actual weight/wet weight)*100
For Calcium Chloride				
UF1	1.9	0.4	1.47	77.36
UF2	2.79	2.26	0.53	19
UF3	1.85	0.43	1.45	78.4
UF4	1.46	0.98	0.48	32.9
UF5	1.18	0.73	0.45	38.1
For Calcium Nitrate				
UF1	2.19	1.45	0.74	33.8
UF2	1.16	0.64	0.52	44.8
UF3	1.32	0.49	0.83	62.9
UF4	4.65	4.24	0.41	8.8
UF5	No growth was observed			
For Calcium Oxalate				
UF1	2.25	1.48	0.77	34.2
UF2	1.33	0.8	0.53	39.8
UF3	0.98	0.4	0.58	59.1
UF4	1.29	0.76	0.53	41.1
UF5	0.68	0.2	0.48	70.6

## Biom mineralization Potential of a Ureolytic Fungus Isolated From Mawsmmai Cave in Meghalaya

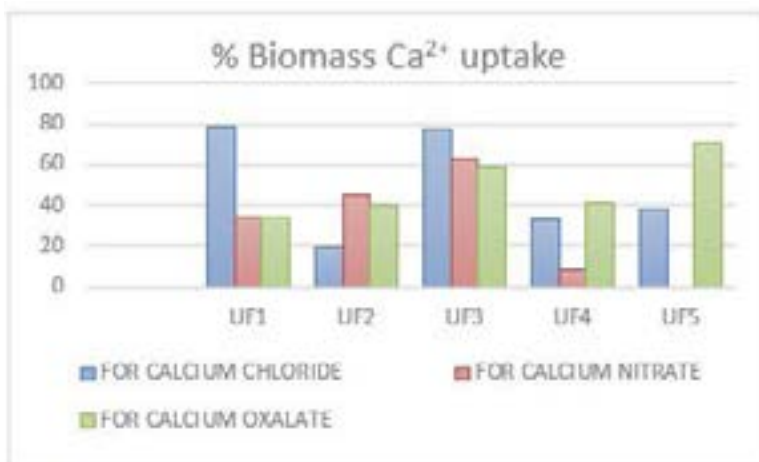


Fig. 4. Biomass  $\text{Ca}^{2+}$  uptake in different fungal isolates

After incubating the fungal isolates at  $30^{\circ}\text{C}$  for 14 days, the biomass production was calculated. It was observed that UF3 had the highest amount of biomass production among other isolates with  $\text{Ca}^{2+}$  removal of 78.4% in calcium chloride-supplemented media and 62.9% in calcium nitrate-supplemented media. However, it did not show the highest biomass production in calcium oxalate-supplemented media. Calcium oxalate-supplemented media was efficiently utilized by UF1. The isolate UF3 was followed by UF1 and UF4 in biomass production. Furthermore, calcium chloride is an overall preferred calcium source for growth among other calcium sources.

### Calcium Precipitation Efficacy

It was observed that calcium chloride was better utilized by the fungal isolates. Hence, calcium carbonate precipitation efficiency was performed using calcium chloride as the calcium source. Upon incubation at  $30^{\circ}\text{C}$  for 5 days, precipitation zones were observed around the fungal cultures UF3 and UF1 on MEAU (MEA with urea) plates supplemented with calcium chloride. UF4 showed moderate precipitation zones. However, no calcium carbonate precipitation efficiency was observed in UF2 and UF5.

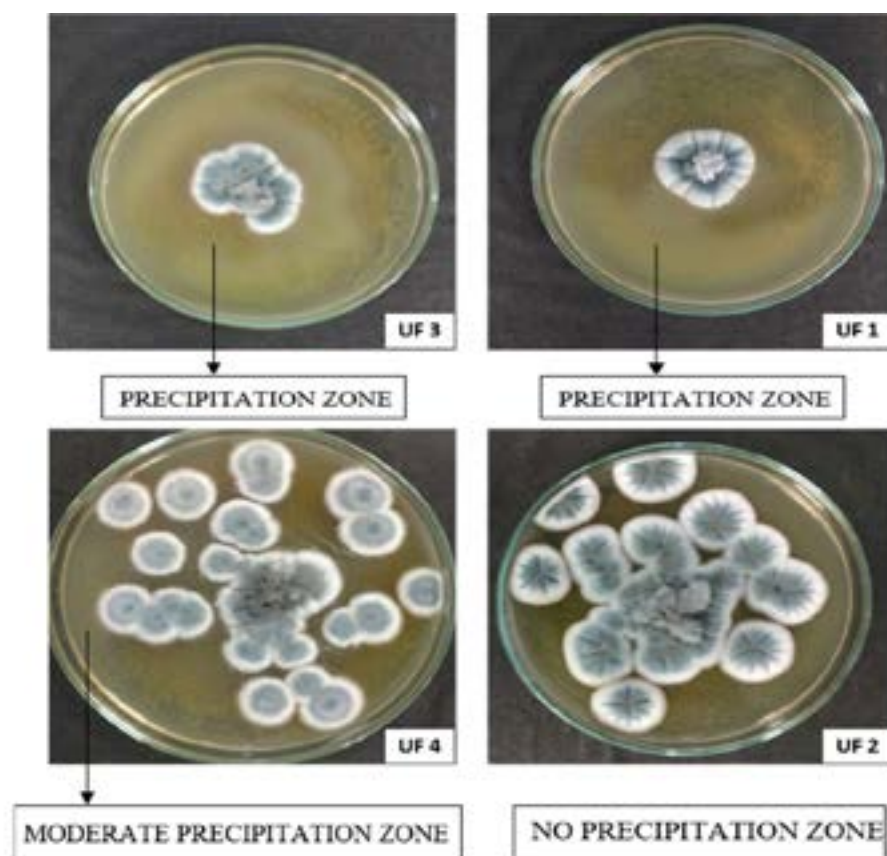


Fig. 5. Precipitation zones formed by different fungal isolates on MEAU plates

### Soluble Calcium Estimation

Analysis of  $\text{Ca}^{2+}$  concentration was done by EDTA titration method.

Table 5: Estimation of soluble  $\text{Ca}^{2+}$  in the media for different fungal isolates

Isolates	Mass of $\text{Ca}^{2+}$ in the solution (gm)	% Decrease in soluble Calcium content
UF1	0.008	68 %
UF2	0.014	44 %
UF3	0.008	68 %
UF4	0.013	48 %
UF5	0.011	56 %

## Biomining Potential of a Ureolytic Fungus Isolated From Mawsmai Cave in Meghalaya

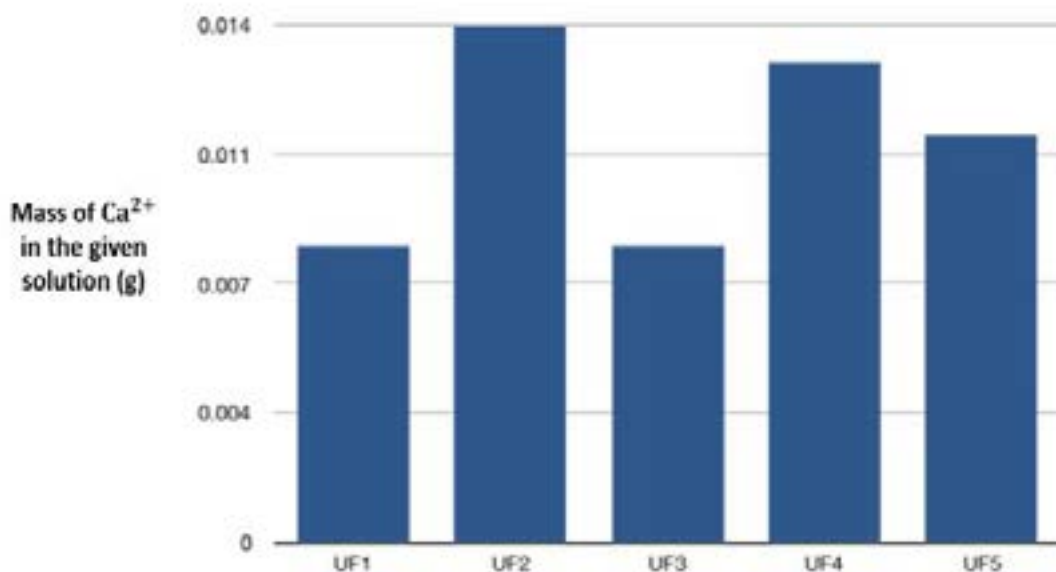


Fig. 6. Comparison of soluble  $\text{Ca}^{2+}$  in the media for different fungal isolates  
The concentration of soluble  $\text{Ca}^{2+}$  was found to decrease in all fungal samples. When related with ureolytic profile, it was noticed that in this case lower soluble  $\text{Ca}^{2+}$  content was seen in case of more efficient ureolytic cultures. Lowest soluble calcium was noticed in case of UF3 and UF1 followed by UF5, UF4 and UF2. UF3 and UF1 showed 68% decrease in soluble calcium content. As the focus of the study was to select most efficient ureolytic cultures with high calcium precipitation efficiency, based upon the results above UF3 was chosen for molecular identification.

### Molecular Characterization and Phylogenetic Analysis

ITS region amplified by polymerase chain reaction (PCR) from the genomic DNA of UF3 using universal primer pair ITS1 and ITS4 were sequenced and the sequencing results were compared using the Basic Local Alignment Search Tool (BLAST) program on NCBI and ITS region sequence homology analysis using GenBank data. Homology analysis of UF3 showed that the degree of sequence similarity of this strain to *Aspergillus versicolor* exceeded 99%. As shown in the phylogenetic tree constructed using MEGA 6, the strain UF3 is related to *Aspergillus versicolor*.

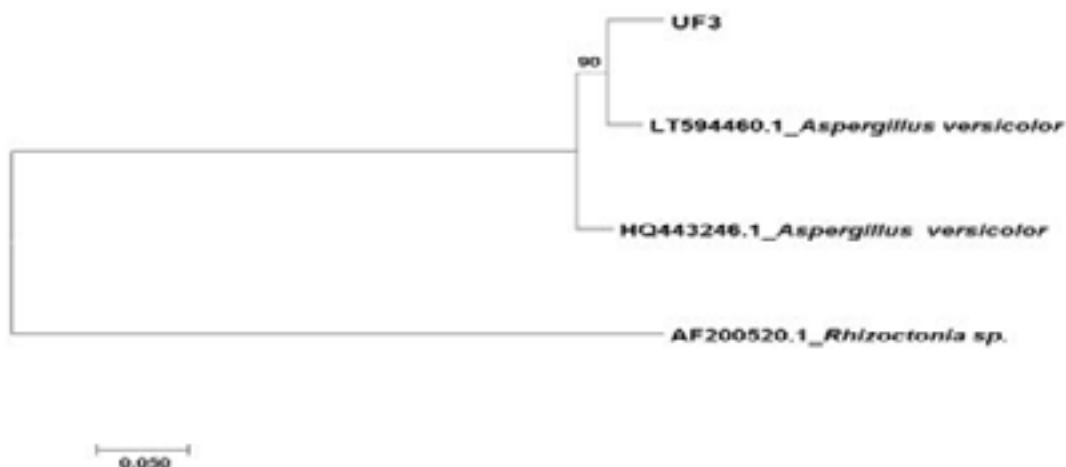


Fig. 7. Neighbour-joining phylogenetic tree based on ITS sequences of the isolate UF3

## Discussion

Caves are important sources of novel fungi that can biomineralize metals. There are very few literature that have explored cave fungi of Meghalaya from the perspective of biomineralization. In this study, a variety of morphologically distinct fungal cultures were isolated from multiple sites within the Mawsmai cave. Following isolation and obtaining pure fungal cultures, lactophenol cotton blue staining was performed to study their characteristic morphology such as shape, size and arrangement of spores and hyphae under microscopic conditions. Fungal strains such as *Aspergillus*, *Penicillium* and *Mucor* were identified upon staining. In addition, 25 were selected based on differences in morphological characteristics. Preliminary studies were conducted in order to check for calcification potential of the isolated fungi under *in vitro* conditions to relate to the biomineralization potential. The isolated fungal cultures were evaluated for urease activity, calcium precipitation efficacy along with their potential to grow in various calcium sources and soluble calcium uptake capability. Based upon the performance of the fungal strains in the various tests, a single fungal isolate (UF3) was selected for molecular characterization. After the homology study and phylogenetic tree construction, the strain UF3 showed relation with *Aspergillus versicolor*.

Precipitation of carbonates has been observed to occur through microbial pathways such as ureolysis, denitrification, ammonification, photosynthesis, methane oxidation and sulfate reduction. Among these, ureolysis has been found to be the most energy efficient and having a high calcification potential, with urea being the nitrogen source of many organisms (Zhu and Dittrich, 2016). In this process, urea is hydrolysed by urease to produce carbonate, which is then hydrolysed to ammonia and carbonic acid. Bicarbonate is formed as a result when these products react with of water whereby releasing ammonium and hydroxide ions leading to pH increase. These reactions are pre-requisites in the process

## **Biom mineralization Potential of a Ureolytic Fungus Isolated From Mawsm ai Cave in Meghalaya**

of carbonate precipitation and are dependent on the availability of calcium and a high pH (Dhami *et al.*, 2017). Hence, screening and isolation of ureolytic fungi was done using Christensen Urea Agar Medium. Fungal cultures with high ureolytic activity were further study on calcification potential.

Biomass estimation was carried out for the selected ureolytic fungal cultures in different calcium sources supplemented with urea in order to determine the best calcium source for growth. It was observed that calcium chloride was the preferred calcium source over calcium nitrate and calcium oxalate. Since calcium chloride supported better fungal growth, further calcification studies were carried out with it. Calcium carbonate precipitation efficacy was determined using calcium chloride as calcium source. Carbonate precipitation was higher in UF3 followed by UF1 and UF4. UF2 and UF5 did not show any zones of precipitation. In addition, maintenance of alkalinity is a major driving force in calcium carbonate precipitation (Stocks-Fischer *et al.*, 1999). UF3 and UF1 showed the highest decrease in soluble  $\text{Ca}^{2+}$  (up to 68% decrease). Along with urease, carbonic anhydrase may also play an important role in carbonate mineralization (Li *et al.*, 2004).

As per the BLAST analysis, UF3 showed 99% sequence identity with *Aspergillus versicolor*. Neighbour joining phylogenetic tree with an outgroup organism, *Rhizoctonia* sp., was constructed. *Aspergillus versicolor* is a slow-growing filamentous fungus commonly found in damp environments. Similar calcifying fungi can bear immense potential for several applications in environmental and civil engineering as removal of heavy metals, radionuclides, calcium carbonate cements,  $\text{CO}_2$  sequestration through biomineralization.

### **Conclusion**

From the preliminary investigation, it is evident that the isolated fungus is able to precipitate minerals. However, to confirm this finding, further tests such as SEM-EDX and other mineralogical analysis like energy dispersive X-ray spectrum (EDS) are required. In addition, quantitative estimation of urease and carbonic anhydrase will provide a better understanding of the fungus and its biomineralization potential. Identification of such fungi present an avenue of applications like bioremediation of heavy metals and in the microbially induced calcium carbonate precipitation (MICP) technology where robust calcitic minerals are designed for use in the construction industry.

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**Biomining Potential of a Ureolytic Fungus Isolated From  
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## **Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community**

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### **Abstract**

*The foundation of self-regulation lies in the early childhood phase and grows expansively over the first decade of the lifespan. Self-regulation is an important predictor of positive outcomes as seen in the previous literature. This study attempts to gain an understanding into the perceptions of self-regulation among parents. A qualitative approach was adopted to fulfil the aim of this paper. Seven semi-structured interviews were conducted on parents who had children between the ages three and seven. The transcripts were analysed using thematic analysis. The global theme that emerged was motivation. Organizing themes that emerged were intrinsic motivation and extrinsic motivation. There are various basic themes that emerged under each of the organizing themes. The study concludes that parents conceptualize self-regulation in children as motivated behaviour that is driven by having goal; that is subservient to authority; that is driven by factors such as temperament and the self-autonomous or independence that the child exerts.*

**Keywords:** Self-regulation, Early childhood, Parenting, Parental perceptions.

### **Introduction**

In the first decade of life, a child goes through many developmental milestones. Developmental psychology scholars agree that early childhood is the period from end of toddlerhood, which is, three years of age and extends to the age of five to six (Berk, 2017; Feldman, 2017). Many cognitive and social constructs are solidified in this period such as inhibition, planning, self-regulation (Berk, 2017).

### **Self-Regulatory Behaviour**

Self-regulation is conceptualized as the ability to engage in goal directed behaviour and cognitions (Vohs and Baumeister, 2016), the ability to plan, monitor and guide one's own behaviour (Grolnick and Ryan, 2002), the delay of gratification (Mischel, 1974) and emotional regulation (Eisenberg and Fabes, 1992). These are considered as components of self-regulation. Poor self-regulation has further been studied in its correlation to higher risk of substance abuse, physical ailments such as obesity, psychopathology, violence, criminal behaviour (Bridgett *et al.*, 2015).

## **Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community**

The construct of self-regulation is emerges in the early childhood phase of development. In Kopp's (1982) conceptualization of the development of self-regulation, it is only at the age of three or four that true self-control emerges where the child is able to regulate and control their behaviour without adult supervision. It is at this stage that a child starts generally starts school; in such settings, that self-regulatory behaviour becomes crucial where the child has extended interactions with peers and teachers (McClelland and Cameron, 2011). Further, self-regulation has seen to predict long-term academic achievement and positive classroom behaviour.

### **Self-regulatory Behaviour in Early Childhood: Antecedents and Consequents**

There are various factors that account for its development in early childhood including the child attributes. Montroy *et al.* (2016) showed that the trajectory of the child would take was dependent on child attributes such as gender and language and background characteristics such as mother's education. Furthermore, Suveg *et al.* (2017) showed that mutual cooperation, reciprocity, in the mother-child dyad has an association with child's self-regulatory behaviour regardless of the family risk status.

Studies have found that family income was associated with self-regulation. In particular, children who come from lower SES have shown to experience greater challenges when it comes to regulation than their peers from higher SES. Further studies have also showed that a higher family income to be positively associated with cognitive self-regulation, but not with emotional self-regulation (Piotrowski *et al.*, 2013; Li *et al.*, 2017).

Two key variable construct of self-regulation are age and gender. Self-regulatory skills of a child improve as they become older (Raffaelli *et al.*, 2005; Piotrowski *et al.*, 2013). In Hong *et al.* (2017) and in Raffalli *et al.* (2005), female children had better self-regulatory skills as opposed to male children in both the studies. High activity temperament in males was also seen as a mediating factor in the differences in gender.

In relation to culture, children from cultures that are inclined to an interdependent show greater self-regulatory behaviour rather than cultures that prefer an independent sense of self. Studies have found that children from a collectivist culture (Nso, Korean, Chinese, Cameroonian) were able to delay their gratification for longer as opposed to those from individualist culture (German, American) ( LeCuyer and Zhang, 2015; Lamm *et al.*, 2017).

In outcomes measures of greater self-regulation studies (Eiden *et al.*, 2009; McKown *et al.*, 2009; Sawyer *et al.*, 2015; van Prooijen *et al.*, 2018) showed that self-regulation predicts social competence, with prosocial behaviour at age four/five in an Australian sample had lower levels of behavioural problems and lower externalizing problem behaviour.

### **Role of Parenting in Self-Regulatory Behaviour**

The child's initial interaction with the social world is through the primary care-givers which in most cases are the parents. Barker (2018) notes that parental characteristics,

parenting styles, involvement, sensitivity, parent-child relationships have bearings on the how a child is able to regulate their behaviour. This shows that a nurturing environment provide a trajectory for a child to develop better self-regulation. The contrary is also true, where harsh, negative and insensitive parenting, does lead to deficiency in the way the child develops self-regulation. Among Mexican families it was found that children who lived in families that were conducive of learning and those whose parents exerted more control showed greater self-regulation. “Respect” and “being well educated” were shown as factors that guide parental expectations of children’s behaviour. (Diaz and McClelland, 2017). Raval *et al.* (2018) showed the increase of positive affect socialization among parents and adolescent girls leads to better emotional regulation among the latter.

From a Self-Determination perspective, Joussemet *et al.* (2008) suggest that in line with the Self-Determination Theory (Deci and Ryan, 1985), autonomy support in the familial context is associated with a host of positive child outcomes, one of which is that of a self-regulation. This indicates that a child will be able to have better self-regulation when there is a facilitative environment.

### **Need and Significance**

It is essential, as pointed out in Jaramillo *et al.* (2017), to contextualize self-regulation to different cultural frameworks and socialization strategies. Further these contribute to the growing evidence that parental socialization with respect to ideals and practice are factors that shape the developmental pathways of a child. There are a few gaps in the literature as well. The focus on how parents perceive and understand their child’s self-regulatory behaviour was very little in the literature.

### **Research Question**

How do parents perceive self-regulatory behaviour in their young children?

### **Method**

#### **Approach**

This study adopted a qualitative approach. Denzin and Lincoln (2000) have opined that there is a consensus among researchers that qualitative research is a naturalistic, interpretative approach. It concerns itself with the understanding and the meanings which people attach to phenomena (be it actions, decisions, beliefs, values etc.) within their social world.

#### **Participants**

The participants for this study were sampled from Shillong, Meghalaya, India. Purposive sampling technique was employed. Parents with two or three children in the age range of three to seven and who are from a middle socio-economic background (as assessed using Kuppaswamy’s Socioeconomic Scale; Saleem, 2018) and a homogenous cultural background were taken the purpose of this study. Furthermore, parents with history of

## **Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community**

alcohol or drug abuse, with a psychiatric/medical condition, (as assessed using General Health Questionnaire-28; Goldberg and Hillier, 1979), and with adopted children were not considered for the study.

### **Data collection**

The participants were interviewed individually so as to avoid social desirability. Semi-structured interviews were conducted that lasted between 35-50 minutes. This was done only after obtaining informed consent from the participants. Participants were also informed of their right to withdraw. Following the interview a debriefing was carried out. The interviews were recorded on a mobile application and later transcribed.

### **Data Analysis**

Thematic analysis, a qualitative analytic method, was used to analyse the transcripts of the interviews collected. Thematic analysis is ‘a method for identifying, analysing, and reporting patterns (themes) within data’ (Braun and Clarke, 2006). Braun and Clarke (2006) have also suggested a six step method of thematic analysis which was followed for the present study. These steps include familiarizing ourselves with our data through multiple reading. After multiple readings preliminary codes are assigned to our data in order to describe the content. Within the codes, a search for patterns or themes in our codes across the different interviews is done. When this is completed a review of the themes is done, wherein some of the common themes are merged, discarded or renamed. Following this the themes are defined and given names and finally a report is produced wherein an analysis of themes is done. Further, to retain confidentiality, all participant names were replaced with initials.

### **Validity of the study**

The interview guide (Appendix A) was validated three methodology and subject experts before going forward with the data collection. Further, in analysing data, memos were containing the initial thoughts, comments and additional questions of the researcher. The additional questions which needed further clarification were sent to the participants for their responses.

When the analysis was completed member check was used to validate findings (Creswell, 2007) where the participants were contacted to comment on the accuracy of analysis and interpretation of their responses. The transcripts of the interviews were sent to the participants via email and they were asked about the accuracy of interpretations made by the researcher. All of them confirmed that the findings channelized the essence of their responses. Some of them did not respond in detail and only approval was inferred; one participant contacted the researcher to discuss one of the aspects of the findings and how it can be improved upon in their child’s life.

## Results and Discussion

The study sample consisted of parents belonging to the Khasi community of Meghalaya from a middle socio-economic status and with no history of alcohol or drug abuse and without psychiatric and/or medical conditions. Mean age was 43 years and age range was 38-49 years.

Thematic analysis of interview data identified one global theme: motivation. (Table 1). The organizing theme and basic have been subsequently laid out.

Table 1. Themes that emerged from the transcripts

Global theme	Organizing theme	Basic theme
1. Motivation	1.1 Intrinsic motivation	1.1.1 Control of emotions
		1.1.2 Temperament of the child
		1.2.1 Autonomy given to the child
		1.2.2 Independent choice making
	1.2 Autonomy	1.3.1 Learning by watching
		1.3.2 Intergenerational transmission
		1.3.3 Goal-Oriented behaviour from parents
		1.3.4 Goal Orientedness from schools
	1.3 Extrinsic motivation	

### 1. Motivation

As a concept, motivation has been studied from various perspectives. From a self-determination approach, motivation has been thought of as the beliefs, goals, expectations that one possess. It is also distinguishes motivation as being intrinsically and extrinsically oriented (Ryan and Deci, 2002; Feldman, 2017). These orientations of motivation are distinct from levels of motivation in that they are concerned with the why aspect of behaviour. Motivation is a key force in human behaviour and interactions. For example it drives us to engage in prosocial behaviour such as volunteering (Finkelstien, 2009). In terms of the data gathered, being motivated emerged as a theme that was recurring through the transcripts, though in different manifestations. In this way, the participants

## **Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community**

have conceptualized the way in which their children control or regulate their behaviour is through having certain motivating factors within themselves or those which are external. Subsequently, the three organizing themes are intrinsic motivation, autonomy and extrinsic motivation.

**1.1. Intrinsic motivation.** According to Ryan and Deci (2002), intrinsic motivation is where an individual does an activity for ‘its inherent satisfaction’ as opposed to being influenced by its consequences. In the data analysis it was seen that there were some factors that the participants attributed to the internal workings of the child’s mind or those that are part of the child’s personality. These are seen as working independent of the rewards. There are two basic themes under this organizing theme – control of emotions and temperament of the child. These two are seen as not being influenced by external rewards.

**1.1.1. Control of emotions.** Emotional regulation has been seen as an important factor in the socialization of an individual. Fisher and Manstead (2016) have commented on the social functions of emotions as having evolutionary origins in terms of meeting survival and reproduction goals. In line with a similar thought, Suri *et al.* (2015) also comments on the way emotional regulation is used to maintain relationships, closeness and cooperation. These are seen as being inherent in the child. Eisenberg and Fabes (1992) have also included emotional regulation to be one component of self-regulation. For example:

“[W]hen he loses he tries to react that he has lost but usually takes just a few minutes for him to calm down” (OJK, Personal Communication, 2019).

Controlling one’s emotion emerged as one of the basic themes through the interviews. The recurring notions of a child being able to soothe oneself in the face of distressing situations, the ability to calm down from an excitable state and the management or ability to control their own anger

**1.1.2. Temperament of the Child.** Temperament is defined as a pattern of thought and behaviour that is consistent over time. These include the personal values, morals, expectations, defences, coping strategies. With most of these characteristics being internal dispositions or nature of the child these can be viewed as being strongly self-regulatory and often considered to be at the core of the child’s temperament (Rothbart *et al.*, 2011; Atherton *et al.*, 2019). When asked about how a participant perceived the ability to self-regulate, the following was the response:

“[A]s a parent...these type of behaviors that he had exhibited I feel that number one these are inherent characteristics of as a child he passes through that phase of growing up especially at that age group” (FRS, personal communication, 2019).

In relation to this Kopp’s model (1982) posits that self-regulation emerges only after 3-4 years of age. Posner and Rothbart (2007) also posit that it is only at this age that executive



attention system is fine-tuned as evidenced in the child's effortful control. Additionally Kiss *et al.* (2014) in their review have found that the development of self-regulation in early childhood is dependant upon the child's temperamental traits and the influences of parental and environmental factors.

**1.2. *Autonomy.*** From a self-determination theory perspective, when a person is autonomously motivated they act with a sense of willingness and their own volition (Deci and Ryan, 2012). The sense of being able to take direct action that will result in real change plays a major part in helping people feel self-determined. Under this theme two basic themes emerge – autonomy of the child and independent choice-making

**1.2.1. *Autonomy of the child.*** This basic theme is related to how a child initiates their own actions and also the ability to reason out with their parents on various topics such as the modification of a study routine or even studying on one's own accord. Participants conceptualize this as being an important part of the child's general repertoire of behaviour. In particular they also viewed it as a process of taking responsibilities on various aspects of their lives. These actions are usually intrinsically motivated and it may also include an element of effortful control where a dominant response is substituted for a sub-dominant response (Posner & Rothbart, 1985).

For example:

“[W]hen he had just joined school I used to be there while he studies but as he moved on from one class to the other he try to take that responsibility on his own” (OJK, personal communication, 2019)

Studies have argued that autonomy is a western concept that is inapplicable to the eastern cultures (Iyengar and DeVoe, 2003). However, there has been some evidence in terms of autonomous behaviour as enhancing well-being irrespective of cultural backgrounds (Chirkov *et al.*, 2003). In the data as well, autonomous behaviour such as those related to doing one's own work on time, taking actions on one's own and independent choice making, emerged as themes while discussing self-regulation.

**1.2.2. *Independent choice making.*** This basic theme related to how a child makes decisions on one's own. Most of the participants implied that this decision making was linked to the amount of independence that was given to the child.

For example, participant EWS expressed:

“They need that as well because sometimes as parents I feel, especially me I'm very strict with them. So they need to have an outlet and they need to have their own decision otherwise I don't want them to be constantly scared or not being able to make independent choices” (EWS, personal communication, 2019)

In the little space that was mentioned in many of the transcripts, three common areas of independent choice making were seen in terms of food, clothing, and toys. Other areas were in terms of when to study, hobbies and choice of outing place. Participants in

## Towards An Understanding of Self-Regulation in Children: Parental Perspectives among the Khasi Community

the study viewed this as a way in which the child is able to express their own individuality, express their likes and dislikes and to express their age-appropriate behaviour as well. Participants also believed that this choice-making however, should be in context to what they felt are needed for the child and not that a child should have a free hand at everything. In the context of self-regulation, independent choice making can be seen in terms of the ability to plan one's own behavior, in line with Grolnick and Ryan's (2002) conceptualization.

**1.3. Extrinsic motivation.** Extrinsic motivation refers to behaviour that is driven by external rewards (Ryan and Deci, 2002). Within the data that was collected, behavioural self-regulation was also contextualized to external social world and in the influence of the 'other'. This 'other' may include a person of authority such as parents or teachers, peers and society at large.

**1.3.1. Learning by watching.** Learning by watching or as Bandura terms it as 'observational learning' has been studied extensively in various contexts. Fryling *et al.* (2011) have given an extensive review of the literature surrounding observational learning. Among the participants, it was also seen that some of the self-regulatory behaviours are learnt behaviours either from parent, from media sources such as films, cartoon characters. This is also an example of how the parents own self-regulation has contributed to the child's self-regulation, where on observing the parent doing certain actions, the child may be motivated or inspired to model these behaviours. It is also perceived as how the children learn new and adaptive behaviours as well. For example,

"I think they have observed it...since I was a joint family so I guess they have seen that I listen to my mother, so they, I think they, just take me that way probably then we have to listen to dad because I tell them sometimes if they don't listen too" (SS, personal communication, 2019)

This also leads to the notion of deferring to authority is very strongly echoed in the data that has been gathered. Participants conceived this deference as being related to behavioural self-regulation in the way of 'control' aspect of behavioural self-regulation. However, self-regulation is usually understood as something internal and this control that the participants have spoken about is more in terms of an external agent applying a force on the child. For example:

"I'm a father, [and] according to him the perception is that I'm an authority. He will perhaps understand what I'm trying to convey so these are steps as a parent...are effective enough at this point of time to regulate such behaviors" (FRS, personal communication, 2019)

These findings are similar to Díaz and McClelland (2017). In the data gathered, deference to authority has been understood in terms of compliance to scoldings, understanding authority figures. The quotes show that by having these authority figures or an understanding of these figures increases the likelihood of increasing self-regulation in children.

**1.3.2. Intergenerational Transmission.** This theme is again in terms of how a child learns self-regulatory behaviour from parents. This manifests in various ways such as when a child is genetically predisposed to have greater self-regulation. For example, on asking about the way in which the participant has influenced the child, the response was: “I don’t know except genetically I don’t know about influence from environment, the ambiance around, I think he’s too small for that. I think its just genetics” (SN, Personal communication, 2019).

It is also in terms of values of the family or the parents, wherein values and a particular culture or habits have been passed on from generation to generation. The parents perceived that some of these values and ideals have been passed onto their children as well. For example:

“I think when it comes to being discipline I think this is something which I always made sure that you know I’m very particular right from when I was a kid in terms of doing things so I always used to tell them when I was in school you know before I even reached home I’ll finish my homework as I would want to play to do something else. So I try to inculcate that into them as well.” (EWS, Personal communication, 2019).

Here self-regulation is viewed as being disciplined and finishing work on time which the participant has inculcated in herself, she tries to inculcate in the children as well. These behaviours are further internalized by the child. This is also a way in which the contribution of the parents own self-regulatory strategies to those of the child’s. This is also seen for example in a religious context.

“Like for myself I normally have that practice of going to church which have made my younger one feel that yes I have to go and I realized this last Good Friday; I told him its good Friday and we have to go to church since its good Friday and he told me, ‘Today is not a Sunday, you never go to church on a Friday, only on Sunday, I’m not going.’” (IW, Personal communication, 2019)

**1.3.3. Goal-orientedness from parents.** This basic theme explores how children are given targets from parents to complete certain tasks. Often this has more to do with complying with parent requests and commands, though it guides the behaviours of the children in a productive manner. These request or commands emerge from the fact that they have to delay their gratification or have to work towards reaching the target. This also works along the line of reinforcement. For example:

“Like once a week we buy [a reward] for them, like Friday or the weekend so normally I would tell him that he were a good boy or if you know you do this this this and you prove that you can do it then on Friday, whatever you want I’ll give you. But only Friday, a weekend, that’s how we do it” (IW, Personal communication, 2019).

These goal or target that the parents have set, show that the child will be able to receive something if they are able to behave in ‘proper’ manner. Putting it succinctly, participant

OJK has this to say about goals:

“[I]f we put a goal in front of them and explain to them the right path and the right way and put a target on them and show them the right way, it should be done in proper way or a correct way then yes they will do that” (OJK, Personal communication, 2019)

**1.3.4. Socialization and goal-orientedness from School.** Children begin school in the early childhood phase. Their understanding of the social world a child on starting school begins socialization outside the family and begins to interact with peers and teachers. In relation to schooling, play is a key element in the process. Through the process of play, the child learns the process socialization and emotional regulation as well (Joy & Sathiyaseelan, 2018). Further there is also an interaction with formal education system wherein, the child has certain academic goals from the system. For example

“The younger one is in different school and the elder one is in a different school so I have noticed that earlier the younger one when she was in pre nursery, unruly and... she’s very careless, she’ll just throw things around but now I think like last year she was very indisciplined but this year I have noticed quite a change in her like when she comes home she knows when she comes back and when its time for us to know when its time for the kids to do their homework, the little one will take out her book and she will try to solve things on her own so again both of them know when its time for them, like they don’t question anymore.” (EWS, Personal communication, 2019)

Here we see that interaction with the formal education system has increased their behavioural self-regulation. In relation, an interaction with peers can also mold self-regulation, for example:

“I have seen him playing, arguing with his friends or with his peers I find that sometimes he’ll say, ok we’ll do it again. He gets along after that. Its not that after that he stops the game or he comes to me blabbering that this is done and this is done. No, no. that doesn’t happen much. Also in school he follow rules because he knows that in school he has to do it” (OJK, Personal Communication, 2019)

This shows that an interaction with peers in school has moulded the child’s behavioural regulation and emotional regulation.

### **Limitations and implication of the study**

The limitations of this study are that a comprehensive conceptualization of self-regulation would include the perceptions of other stakeholders such as teachers and children. Further, the findings may not be generalizable to the population as the sample is small. Implication include that these findings can be included in intervention programmes to increase self-regulation among children. In addition, these findings can be used in parenting programmes which focus on improving a child’s behavioural and emotional regulation. Future directions of research include a further cross-cultural analysis of perceptions of self-regulation and an inclusion of various stakeholders such as teachers and children as

well.

## Conclusion

The themes that emerged from data gathered have been in support of the theorizations of self-regulation as a concept that is multi-dimensional and having many aspects. The perceptions that were gauged show that self-regulation in children as behaviour that is driven by having goal; that is subservient to authority; that is driven by factors such as temperament and the self-autonomous or independent choice making that the child exerts.

## Declaration

This study has been approved by the Institutional Review Board at CHRIST (Deemed to be University), Bengaluru, India

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**Towards An Understanding of Self-Regulation in Children: Parental  
Perspectives among the Khasi Community**

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## Appendix A– Interview Schedule

### Interview Guide

1. Can you explain your child's behaviour in situations where he/ she for example, is able to wait for their turn, can he wait till the food arrives, can he/she manage his frustration when he/she loses a game. Does he/she engage in self-talk to regulate his behaviour?
  - What do these behaviours mean to you or how do you interpret them?
  - Do you reward your child based on these abilities (please explain: if yes, how ; if no, why?)
2. Can you give me more examples of such behaviours where he/she is able to regulate his behaviour to suit the given situation?

**Towards An Understanding of Self-Regulation in Children: Parental  
Perspectives among the Khasi Community**

3. At home, can you elaborate on the practices that you undertake to enforce/enhance these abilities?

- Can you explain how you perceive such practices?

4. As your child has joined school, can you tell me about the changes that you see in these behaviours?

5. Could you explain to me, some ways in which your child is able to control/regulate his/her behaviour without adult supervision?

6. Can you tell me about your child's behaviour with his/her peers?

7. Can you explain how you encourage your child to be independent?

8. Could you explain when or what are the areas that your child makes his/her own choice?

- Tell me more about it?
- How do you perceive this choice making?

9. Could you explain your own practices in self-regulation. Such as when you have to watch a movie, but you know that you have loads of meetings/work the following day so you decide to go to bed instead of watching it.

10. Can you explain if any such instances have contributed to your child's own self-regulatory behaviour?

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## **Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup District, Assam, India**

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### **Abstract**

*In the lockdown period, the dairy industry in Assam as in other parts faced lots of difficulty which impacted the livelihood of several dairy farmers. As per reports, the dairy farmers had to throw away their milk in the river and pond due to loss of supply provision. This article presents the scenario of milk farming uplifting living condition and economic status of the Dairy farmers. Field report reveals that covid19 virus had a severe impact on dairy farmers livelihood. Coronavirus had negative impact on their daily activities and even milkmen could neither sell milk nor could buy fodder for the cattle. The present study was conducted in Gorkha population concentrated in the 10th mile area of Guwahati (Kamrup), Assam. Basically, this area has the community engaged in rearing cow and goat and with milk business they supply milk to the greater Guwahati area. The study was based on qualitative research using in-depth interview and telephonic interview to collect information. The study has used both primary data and secondary data. The study was conducted in the rural area in order to find out the basic challenges encountered by the dairy farmers during first part of lockdown days due to COVID19.*

**Key Words:** COVID-19, Dairy Farmer, Livelihood, Challenges.

### **Introduction**

COVID-19 is the short form of “Coronavirus disease 2019”. It is the official name given by World Health Organization (WHO) and its infection was first recorded in Wuhan, China in 2019. Corona virus is highly contagious and it has affected many countries. The coronavirus mainly spreads from person to person and also can also spread from contact with infected objects. This deadly virus has affected large number of people all over the world. World Health Organization has mentioned that most of the infected people will develop mild to moderate symptoms.

Coronavirus had claimed more than 156000 lives and infected nearly 2.3 million people around the world (BBC news, 28/4/2020). More than 1.9 million coronavirus infections have been reported and over 119,483 people have died worldwide as on April 14, 2020

(TOI, 2020). Governments of all countries are struggling to control the pandemic. Different countries announced social distancing and lockdown across the country. This really affected the world economy. Because of COVID19, there has been a widespread loss of jobs in several sectors. Agriculture, allied Activities, poultry farming, dairy farming and agricultural related activities are badly hit by the COVID19 pandemic. The present and future effects of the pandemic COVID19 are being discussed globally as it has significant consequence on majority of population. Population living in rural areas with agricultural activities and rural labour migrants are worst affected sector by COVID19 in India. The paper presents the status of dairy farmers in Assam (India) and the study presents description on history, migration of the Nepali community to Assam with respect to the dairy farmer community especially with regard to the situation of dairy farmers of Kamrup district of Assam and situation related to COVID19.

The colonial period has witnessed the greatest human movement and settlement of people resulting in the transfer and distribution of diverse population groups in different parts of the world. Commercialization and industrialization of the economy under the aegis of the colonial state also served to stimulate the natural migratory movement of people. After the British occupation of Assam, under the patronage of the colonial government, large number of Nepalese migrated to this region in search of life as *Gopalak* (cow rearers) and soldiers. The British came to Assam with lot of hope and aspiration, but they could not reach their goal as Assam was not a populous state. The devastation and depopulation during the period of civil wars and Burmese invasions had left 'vast tracts of waste land throughout the province'. Encouragement was given to the immigrants to come and settle in the province. In an industry-less country, Assam had no other option but to increase its land revenue. Lands were leased out to the people in favourable terms. British government had not missed any opportunity to maximize their revenue collection. Accordingly grazing which was free from time immortal in Assam was taxed. To attract the people and increase the revenue of the region, Company introduced the Wasteland Rules on 6th March, 1838. According to the Rules, one-fourth of a land grant was to remain revenue-free in perpetuity. The remaining portion of the grant, too, was to remain revenue-free for initial five to twenty years, according to the nature of the wasteland concerned (Guha, 2006). 'Large scale' Nepali migration into the Assam began only with the colonial intervention. British official viewed the native people as 'lazy', 'opium addicted' and 'indolent' and encouraged the surplus Nepali population to immigrate to Assam. The active policies pursued by the colonial government opened up the valley to the Gorkhas. The colonial government required a labour force for all and sundry work from clearing forests to lumbering to domestic help, which was effectively provided by the 'versatile Nepali'. Apart from the recruitment of Nepali martial classes in police and military, what seems to have attracted the Gorkhas to Assam was the vast expanse of greenery dense forests and hills, abundance of wastelands full of lush green vegetation. This was, indeed, was an ideal scenario for cattle-breeding (Chetry, 2016). So, the rise of dairy farming industry in Northeast was a part of the development of the colonial

## **Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup, District, Assam, India**

economy in the region. In Assam, the Gorkha dairymen presently constitute the largest milk producer and supplier in the state supplying to 80% of the region's population, with an annual turnover of approximately 20 crores (Gurung, 2018).

Milk is a complex food that contains vital nutrients for young mammals. Milk is the only food of the mammal during the first period of its life and the substances in milk provide energy and antibodies that help protect against infection. For humans, milk and dairy products make a significant contribution to meeting our body's needs for calcium, magnesium, riboflavin, vitamin B<sub>12</sub> and B<sub>5</sub> and therefore play a key role in our development (<https://dairyprocessinghandbook.tetrapak.com>). Consumption of cow milk had probably started with the domestication of the cow. Cow milk is a source of other milk products such as cheese, cream, butter, Ghee, Curd, ice cream etc. The United States, India, China and Brazil are the world's largest milk producers and exporters. According to Food and Agriculture Organization of United Nations (2020), India is the world's largest milk producer, with 22% of global production, followed by the United States of America, China, Pakistan and Brazil ([www.fao.org](http://www.fao.org)).

Milk production has become an important source of income for millions of rural families. Milk production and milk farms are providing employment to the rural youths and income generating opportunities particularly for women farmers. Milk production/farms also include all family members to produce more and earn more. This activity not only leads to employment generation, but also regulates monthly income. It provides nutritious food, generates opportunities especially for women and generates income to save for future.

### **Universe of Study**

Assam is one of the eight states of northeast India. Northeast India is differently understood and placed in the background of its geo-political entity and historical context. Geographically, Northeast is at the extreme north-eastern part of India, and has international boundaries with Bhutan, Tibet, China, Myanmar and Bangladesh. Assam, the gateway to the Northeast India is most strategically situated in the Eastern Himalayan region between 24.480 to 27.90 North latitude and 89.420 to 96.100 East longitude. The region is geographically isolated from the rest of India because its only land link with the rest of the country is through a narrow strip of land in the state of West Bengal. Therefore, northeast is a geographically 'recognizable entity'. For that matter, northeast is unique making it unique from the mainland India in terms of its topography, climate, ethnic groups, unique caste structures, races and groups - each having its own distinct culture and customs.

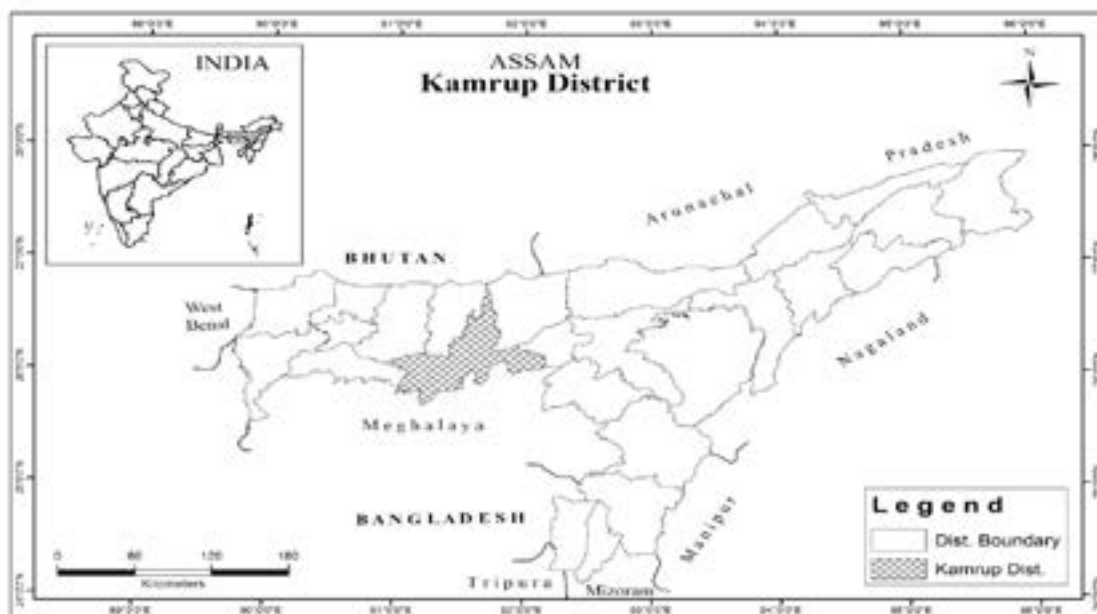


Fig. 1. Map showing Kamrup district of Assam

The present study was carried out in Amerigog, 10<sup>th</sup> mile, Guwahati, Jorabat area, Kamrup District (Fig.1), Assam. Amerigog is located in Sonapur circle at 26.29°N latitude and 91.65°E longitude of Kamrup district, India. The study was carried out taking the Gorkha Dairy farmers as the respondents.

### Methods and Methodology

The present study is mainly qualitative in nature and the data were obtained by using questionnaire approach. The study is based on qualitative research and used in-depth interview and telephonic interview to collect information. The researcher has used telephonic interview as a tool to collect information due to lockdown and to maintain social distance due to COVID 19 pandemic. Secondary data were collected from reviews of relevant literatures, books, newspaper and e-resources. The objectives of the study is the contribution of Dairy activity to the farmers economy and to study the challenges and problems faced by Dairy Farmers due to COVID19 pandemic and lockdown in the year 2020.

The researcher selected the farmers with milk farming as the only livelihood for them and it also considered the problems and challenges faced by them due to COVID19. The selected village of the respondents is dependent on milk farming. In Assam, only 40 thousand liters of milk is being marketed per day helping the economy of individual families. A small milk farmer residing in the area produces milk while the large milk farmers produce milk and also other milk products. Milk is the only product which has

## **Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup, District, Assam, India**

the highest demand in urban areas. Non-milk producers are engaged in producing other by products Milk chocolates, sweets and milk shakes and make their business. This makes the two groups dependent on each other for their livelihood. COVID19 tremendously affected these livelihood earners linked with dairy farms. The dairy farmers were also worried about fodder shortage, rise in fodder prices and inaccessibility of forage due to nationwide lockdown. Lockdown had affected their daily routine and transportation of milk in the markets. *On 24 March 2020, the 21day lockdown of India was announced to control the spread of COVID-19 which created a long-lasting impact on Indian farmers. Farmers engaged in allied activity, small entrepreneurs and marginal farmers cultivating unpreserved commodities were worst hit.* Millions of farmers across the country were throwing away their perishable produce; fruits, vegetables and milk being disposed of into compost pits and irrigation canals.

### **Discussion**

The Gorkhas living in Assam, are mostly descendants of those who migrated from elsewhere to work in various sectors by the British. Now, Gorkhas in Assam basically work in agricultural fields, rearing animal and are into milk business. They have assimilated with the greater Assamese society and culture, and also have maintained their identity as well. Upadhaya (2017) mentioned in his article '*Cattle Culture of Gorkhas and Dairy Development of Assam*' that cattle farming is known to be the primary and culturally inherited business of the Gorkhas in Assam. Therefore, it is obvious that this community contributed a lot to the development of the dairy sector in the state. Development of any sector in an economy basically depends upon the primary stakeholders. In Assam, the Gorkhas are the primary dairy farmers, prior to the British regime. If one looks impartially at the first few Town Milk Supply Schemes established in Guwahati, Jorhat, Tezpur and Dibrugarh, they were made functional before 1980 and the location of the catchment area was identified by the survey conducted at the far end of the Second Five Year Plan for setting up Dairy plants under Town Milk Supply Schemes. It reveals that such plants were stalled where Gorkha settlement was concentrated. From the field observation in this study, it was found that there are three types of dairy farmers available in the village of Amerigog, 10<sup>th</sup> mile, Jorabat area (Kamrup) and they are, (a) Small Milk Producer (1-3 milch animals), (b) Medium Milk Producer (4-6 milch animals) and (c) Large Milk Producer (more than 6 milch animals). These farmers' rear different breeds of cattle like Indigenous breeds and Cross breed cattle. Indigenous breeds are Red Sindi, Sahiwal and Cross breed cattle includes Jersey, Holstein, Friesian etc.

In the study area, it was found that very few respondents attended school and passed class XII examinations. After passing their education, they came back and joined the family dairy farming business. They revealed that rearing cattle was part of their culture, milking the cattle as livelihood option and it was the basic source of income. The household income was dependent on the amount of milk sold in the market. The more the milk production, the higher they are sold in the market, which led to surplus household income.

Farmers kept limited amount of milk for own consumption and major part of milk was marketed along with use in production of other milk products. Dairy farmers preferred to employ their family members as labor to operate dairy activities. Basically male members of the family took care of the and it became a fulltime job. These Gorkha dairy farmers community have adopted appropriate technology to manage cattle and the health and hygiene of milch cattle. Dairy farmers were given training on Animal husbandry and dairy farming by Government of Assam (Department of Animal Husbandry and Veterinary, Government of Assam, India). Cattle falling sick, weak and unable to produce milk was found to have negative effect on milk production by the farmers. In such crisis they needed immediate care and medication from the veterinary doctor. Such treatments happened to be costly and as such cattle sickness negatively affected their daily income. Dairy farmers in the studied Kamrup district had appealed to the state government to help them out of the COVID19 crisis to reduce price of fodders and to make arrangement for cold storage facilities to preserve the milk and other milk products.

### **Problems and Challenges**

Dairy institutions include dairy farmer groups or organizations, cooperatives, service providers, market agents, research and development organizations, governmental organizations and community-based organizations. These dairy institutions were not in the mainstream program during the COVID19 pandemic and nationwide lockdown. These dairy farmers and organizations were also not prepared for such situation in the midst of the COVID 19 lockdown and post lockdown scene. This nationwide lockdown severely impacted their livelihood.

In Assam during lockdown period in the year 2020, the dairy farmers faced problem in distribution and selling of milk. As the lockdown period was extended, difficulties arose among the farmers. It severely impacted dairy farms, individual dairy farmers and milk cooperatives as well across Assam during the ongoing 40-day lockdown period. Dairy farmers faced difficulty to arrange fodder for livestock as feed carriers have stopped due to lockdown period. Farmers were worried that their cattle may fall sick due to feed shortage, rise in fodder prices and unavailability of forage and fodder during the coronavirus lockdown. The traditional dairy farmers in Jorabat area of Kamrup district were waiting for the state government to relieve restrictions and help them out in this crisis. A major reason, as stated by one of the respondents is “the closure of all hotels, restaurants and sweetmeat shops that were the bulk buyers”.

Milk distribution became difficult during the lockdown so the farmers tried to make the milk products such as paneer and ghee from the unsold milk. They sold it in the nearby villages. However, villagers did not prefer buying paneer as fish and meat was available in their home. These farmers sold the milk byproducts to some extent but was not sufficient to run the family. Farmers on large scale threw away milk on the roads and river as they could not sell it due to restriction on transport, closure of market and due to lockdown.



## **Corona virus Disease (COVID-19) and livelihood: Impact on Dairy Farmers of Kamrup, District, Assam, India**

Dairy farmers faced fodder crisis, cattle food grain and medicines which also became costly during the COVID19 period. They appealed to the government to reduce prices to sustain their economy. The farmers stopped feeding costly fodder to their cattle to save their earnings which reduced the quantity of milk production.

The Sitajakhala Milk Cooperative Society is one of the oldest and largest dairy cooperatives of Assam located in Morigaon district. Sitajakhala Milk Cooperative Society chairman Ranjib Sarma told PTI, “The lockdown has affected the operations of the cooperative in multiple ways. Our daily procurement at this time of the year is between 17,000 litres and 18,000 litres.” He added “another problem we are facing is the fear psychosis among villagers, who are trying to restrict entry of people from the cooperative or other villages. This is creating difficulty in movement of traffic which has affected distribution of fodder and milk,”(Indian Express, 19 Apr 2020). He also added the price has been reduced to Rs 50 per liter from Rs 54 for disposal of its daily production. The commercial dairy farmers of Assam were looking up to the state government to build an effective milk marketing chain that would give farmers a fair return of their investment, and assist farmers by paying at least Rs 5 per litre (Indian Express, 19 Apr 2020).

### **Conclusion**

Rice cultivation is the main occupation in Assam and Tea occupies second as commercial crop cultivated in Assam. Animal husbandry is another important allied sector in the state and plays an important role to meet the need of non-vegetarian population. Dairy farming is providing milk and milk products to Assamese population. Assam is an agriculture state, accounting for livelihood of about four fifths of population and is the key sector to the state economic growth.

Dairy sector has great economic and social significance in India. According to livestock census 2017, there are 166 million indigenous cattle, 33 million crossbred cattle and 105 million buffalos in India. In India, 80 million families are engaged in dairy sector including traditionally domesticated animal. India is endowed with the largest livestock population in the world. It accounts for about 57.3 per cent of the world’s buffalo population and 14.7 per cent of the cattle population. The value of output of milk was Rs. 3,05,484 crore in 2011-12. The total milk production in the country was 127.9 million tonnes per annum at the end of the Eleventh Plan (2011-12) and the demand was expected to be 180 million tonnes by 2020. So there is scope to increase the milk production and make it a profitable business. Milk farming is expected to help the farmer towards a better livelihood and income generation.

Livelihood in rural areas of country has had the worst effect, though the corona virus has not reached there yet during the study period. While the government announced several measures, including exemption of agriculture and fisheries from lockdown restrictions in late March 2020, there has been a lacuna in delivery and implementation at the ground level. There have also been gaps in reaching relief



in cash and kind to the poor, needy and vulnerable. As we notice the effects of pandemic, proactive measures by the state with humanitarian perspective are called for as we begin operating in a 'new normal': more relief in kind (e.g. making the PDS universal, ensuring whoever is needy gets the necessary support and is not left starving due to bureaucratic hurdles like lack of ration card) (Bhabani, 2020).

The present study found that dairy farming is also an important livelihood option like other agricultural activities. Study showed one family or whole community can depend on dairy farming as livelihood opportunity and earn money. These dairy farms are providing nutritious food to hundreds of families, earning income and creating employment as well. Dairy farms in (Jorabat and Sonapur) in Kamrup area of Assam are providing milk and milk products for many years and people are dependent on them for the supply. Many sweet owners of Guwahati City are also dependent on these dairy farms. But due to COVID19 several Dairy farms could not sell their milk and these farmers had to throw away milk in the streets and ponds. Therefore, data and studies on dairy sector is important from the research point of view as it has large scale ramifications and impact not only on smaller community but also to the contribution it makes to the overall economy of a region.

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## Myth and Reality of Secularism in India: An Analysis

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### Abstract

*Secularism is the way by which everybody enjoys religious freedom. India is a country of diverse religions which has the concept of equality of faith enshrined in its Constitution. Although the term 'secular' was not incorporated in the Indian Constitution upon its inception, it was included in 1976 through the 42<sup>nd</sup> Amendment. However, in spirit, the values of secular character were interwoven in the constitutional fabric of India from the very beginning. This aspect has time and again also been emphasised by the Judiciary. It can safely be asserted that secularism is indeed one of the fundamental ideals of the Constitution and can never be changed. However, sometimes it has been found that State indirectly favours a particular religion against the concept of secularism. This paper attempts to understand the meaning and concept of secularism in India and its challenges.*

**Keywords:** Secularism, Democracy, Discrimination, Constituent Assembly, Constitution, Supreme Court.

### Introduction

India is a vast country where people of various religions, castes, creeds, and socio-cultural backgrounds live. This country is diverse also concerning its diverse population. Although, the word secularism was not mentioned in the Constitution since the beginning, it was embedded in our polity as its philosophical phenomenon. Though secularism is the basic structure of the Indian Constitution, its practicability in contemporary Indian conditions is questionable because there is increasing use of religion in the social construction of ethnic and communal identity, consequently forming political mobilization. The caste, religion, and regional divisions are still prevalent in India and play a significant role in shaping the ideologies of individuals and groups. While secularism has been integral to India's democracy for more than seventy years, its limitations and implementations are still debatable. The actual meaning of secularism is that the State should have no religion of its own, and no one could proclaim to make State a theocratic State (Basu, 2007) but it does not mean that the State should stay aloof from religion. The object of inserting the word 'secular' in the Constitution was to spell out expressly the high ideas of socialism, secularism, and integrity of the nation. Secularism enables people to see

the imperative requirements for human progress in all aspects and cultures, including social advancement (Basu, 2007). But, nowadays, secularism has also been equated to the concept of modernity which is a subjective thing that matters from an individual perspective. Undoubtedly, secularism and modernity are interlinked, but it is a general feeling that the central ideal of equal respect for all religions has not been translated into a social reality.

This paper aims to discuss the meaning and concept of secularism and its relevancy under the Constitution of India. How far the spirit of secularism is followed in India has also been addressed in the paper. Apart from the above, the Judiciary's role regarding the interpretation of secularism has been highlighted in the discussion. This paper also strives to figure out how the constitutional amendment changed the philosophy and practice of secularism in the country. The methodology that has been applied to complete this task is doctrinal. This paper is based on primary and secondary sources.

### Meaning and Concept of Secularism

Secularism has not been clearly defined in any document. However, it is a system of doctrine and practice that disregards or rejects any form of religious faith and worship (Basu, 2007). The basic principle of a secular state is that there should not be any interference by religion in the affairs of the State and *vice versa*, i.e., the State also should not interfere in the affairs of religion (Tarkunde, 1995). As per Webster's New World Dictionary, secularism signifies the belief that religious and ecclesiastical matters should not enter into the function of the State (<https://shodhganga.inflibnet.ac.in>). The concept of secularism is not merely a passive attitude of religious tolerance; it is also a positive concept of equal treatment of all religions (Jain, 2008). A secular State does not extend patronage to any particular religion. The State will not establish any State religion, nor will the State accord any preferential treatment to any citizen or discriminate against him/her on the ground that he/she professes a particular religion (Pylee, 2007). However, it does not mean that a State which does not have its own religion is a theocratic State. A secular State is neither pro nor anti any particular religion. It is neither religious nor irreligious. Also, a secular State maintains neutrality in matters of religion and provides equal protection to all religions (Jain, 2008). In other words, it can be said that secularism means that the status of all religions is equal.

There are two main concepts of secularism, (a) Western concept and (b) Indian concept. The Western concept of secularism is based on the ideas of Thomas Jefferson. He had said in 1908, "erecting the wall of separation between Church and State is absolutely essential in a free society" (<https://www.newworldencyclopedia.org>). According to him, there ought to be a separation between religious institutions from the institution of States. Freedom of conscience for individuals circumscribed only by the need for public order and respecting other individuals' rights is a guiding principle (<https://www.newworldencyclopedia.org>). Meaning that if one religion is practiced by an individual and this practice infringes upon

the rights of followers of other faiths, restrictions can be imposed on the former. Thomas Jefferson held the opinion that there should not be any discrimination against individuals on the basis of their religion. The western conceptualization of secularism began in the 19<sup>th</sup> century. The term secularism was coined by British reformer Jakob Holyoke in 1851 (<https://books.google.co.in>). He used this term to describe his views of promoting a social order separate from religion without criticizing religious belief.

As far as the Indian scenario of secularism is concerned, a look into the records of the Constituent Assembly's debates reveals that the general understanding amongst members of the assembly was that India was to be a secular state. The Constituent Assembly emphasized the secular foundation of India. The Assembly declared that secularism, as adopted in the Indian Constitution, was not an anti-religious concept; instead, it prevented discrimination against the citizens based on religion. One of the Members of the Constituent Assembly, Mr. H.V. Kamath, said, "When I say that a State should not identify itself with any particular religion it does not mean that a State should be anti-religious or irreligious. India would be a secular State, but according to me, a secular state is neither a godless State nor an irreligious nor an anti-religious State" (Pylee, 2007).

Dr. B. R. Ambedkar explained secularism in the following words; "It (secular state) does not mean that we shall not take into consideration the religious sentiment of the people. All that a secular State means is that this Parliament shall not be competent to impose any particular religion upon rest of the people. This is the only limitation that the Constitution recognizes"(Pylee, 2007).

After the Constituent Assembly debate, mainly two views of secularism emerged; one is Gandhi's view, and the other is Nehru's views. Gandhi's opinion was based on '*Sarva Dharma Sambhav*' i.e. equality for all religions. According to him, religion cannot be separated from public life. He said that religion is important for him, and he will respect other religions also. Nehru followed the principle '*Dharma Nirpeksha*'. According to him, religion should be a private matter and should not guide public life. After independence, a new concept of secularism emerged, which was closer to the views of both Gandhi and Nehru. Independent India adopted the following ideas of secularism;

- i. The State shall permit freedom of practicing any religion.
- ii. The State shall not associate with any religion.
- iii. The State shall honor all faiths of equality.

The first two are similar to the western concept, whereas the third one is the innovative idea for Indian secularism.

Justice P.B. Gajendragadkar, the former Chief Justice of India has said, "The State does not owe loyalty to any particular religion as such, it is not irreligious or anti-religious, it gives equal freedom to all religions"(Singh, 1952). He commented on the non-inclusion of the word secular in the Constitution from its inception, saying that the omission of the

word 'secular' or 'secularism' is not accidental but was deliberate ( <https://shodhganga.inflibnet.ac.in>).

## **Indian Constitution and Secularism**

The Indian concept of secularism is that the relations between State, society, and religion are not well defined. Personal laws vary from religion to religion. The precarious position of religious minorities and the affiliations of political formations with religious fundamentalists pose severe challenges to the success and future of secularism in India (<https://www.hindustantimes.com>). It can be conceded that secularism in India today is too politicized, and it is necessary to find ways to depoliticize secularism and to move it further into the domain of civil society. At the outset of the making of the Constitution, the concept of secularism was not expressly mentioned in the Indian Constitution. However, the Indian Constitution has spelled out several provisions in Part III (Articles 14, 15, 16, 25, 26, 27, 28, 29, 30), Part IV (Article 44), and IVA (clause (e)) that reflects the existence of secularism. The conjoint reading of all these Articles makes it evident that the intention of the Constitutional fathers was neither to oppose religion nor to promote rationalization of culture. Although the word 'secular' was first time inserted in the Preamble of the Constitution by the 42<sup>nd</sup>(Amendment) Act, 1976, which came into effect on January 3rd, 1977, secularism was part of the Constitution word secular was inserted in the Preamble (Singh, 2013). The 42nd Constitutional (Amendment) Act of 1976 stated that 'secular' means a republic in which there is equal respect for all religions. Despite the clear letters of the law, the Hon'ble Supreme Court has interpreted it on various occasions via various judgments. But one thing is apparent secularism, as mentioned in the Indian Constitution, does not mean anti-God or Atheist. Instead, it means the State should not have any religion. Supreme Court of India in the case of *Indira Nehru Gandhi v RajNarain* (AIR 1975 SC 2299) held that secularism means that State shall have no religion of its own and all persons of the country shall be equally entitled to the freedom of their conscience and have the right freely to profess, practice and propagate any religion.

Suppose we look into the situation even before 1976, people of all religions in India have equal rights and are free from discrimination. Article 14 of the Constitution provides equality before the law and equal protection of laws to all. However, reasonable classification can be made and should be treated alike. The Constitution of India prohibits the State from discriminating against any citizen on grounds only of religion, race, caste, sex, place of birth, or any of them. Article 15(1) Article 15(2) emphasizes that no citizen shall, on any of the above grounds, be subject to any disability, liability, restriction or condition concerning access to shops, public restaurants, hotels and places of public entertainment or the use of wells, tanks, etc., which are wholly or partly maintained out of state funds or are dedicated to the general public. Article 16(1) lays down a general rule that there shall be equal opportunity for all citizens relating to employment in the office of the State (Singh, 2013). Article 16(2) of the Constitution, is an elaboration of Article 16(1) says that no citizen shall, on grounds only of religion, race etc., be ineligible for, or

discriminated against in respect of, any employment or office of the State (Article 16 (2)). These provisions adequately ensure the equality of citizens belonging to all religions.

India is a pluralistic society and multi-religious country; that is why the framers of the Constitution adopted the concept of religious neutrality and conferred religious freedom to various religious groups (Jain, 2008). The religious tolerance and equal treatment to all religious groups in the spirit of our secularism (Jain, 2008). Indian Constitution adopted the principle of non-interference in religious matter with certain exceptions (Jain, 2008). Articles 25 to 28 of the Indian Constitution make clear that everyone living in India should be entitled to profess his religion without hindrance, so long as the citizen obeyed the common law of the land. Article 25, a reservoir of religious and secularism in India, makes explicit provision, when and how religious freedom is available and curtail freedom? This Article guarantees to every person the right to freely profess, practice, and propagate his religion. In Article 25, the word 'any person' has been mentioned, reflecting that voluntary conversion from one religion to another religion is valid as a person is free to have faith in any religion (Rai, 2008). But conversion by force, fraud, or inducement is not valid because it may disturb the public order. Also, Article 25 empowers the State to impose restrictions in the interest of public order. Article 25(1) 'Public order' here means a thing disturbs the current of the community's life and does not affect merely individual. If the situation disturbs the current life of the community, it will amount to a disturbance of public order (*Stainslaus v State of MP*, 1977)

The State will not interfere in religious affairs, so the State cannot regulate religious activity. However, a secular activity that is associated with the religious matter may be regulated by the State (Article 25(2)). An activity will be treated as religious if it is regarded as an essential and integral part of the religion and will be secular if it is not considered a necessary part of religion. The practice of *Talaq-e-biddat* or Triple Talaq is declared illegal, holding that it is not protected under Article 25 of the Constitution as it is not an essential religious practice (*Shayra Bano v Union of India*, 2017). Also, under certain circumstances, the State can interfere in religious practices for social reform. The rationalization process should bring about this social reform. For such social reform, no coercive force of the law should be exercised. However, Sometimes situations compel the State to use legal coercion for urgent social reform. For instance, an Act that was enacted to prohibit polygamy among the Hindus was held valid because polygamy was not an essential and integral part of the Hindu religion. Similarly, Sati and *Devdasi* system in Hindus and 'triple talaq' in Muslims have been abolished as these were social evils and not the essential part of the religions. Polygamy, which is still permitted among Indian Muslims and is not permissible in many other Muslim countries, reflects that polygamy is not an essential part of such religion. Hence, for social welfare, social reform, and the nation's interest, the Uniform Civil Code can also be applied as it is permitted by the Constitution of India (Article 25(2)(b)).



## Role of Indian Judiciary in Shaping the Secularism

The word secular is not static; instead, it is dynamic. There cannot be any fixed view on this concept for all time. From time to time, the Court gives the different meaning of secularism and enforces it in practice. In *Sardar Taheruddin Syedna Sahib v. State of Bombay* (AIR 1962 SC 853), the apex court held that 'Art. 25 & 26 serve to emphasize the secular nature of the Indian democracy, which the founding fathers considered to be the very basis of the Constitution. In *Kesavananda Bharati v. State of Kerala* (AIR 1973 SC1461) the Supreme Court held that that secularism was a part of the basic structure of the Constitution. Chief Justice Sikri said that the secular character of the Constitution was the essence of it. Justice Shelatand and justice Grover stated that the secular and federal nature of the Constitution were the main ingredients of the basic structure. Justice Jaganmohan Reddy stated that "Liberty of thought, expression, belief, faith, and worship could not be amended at any cost because they were part of the basic features of the Constitution.

Similarly, the Supreme Court of India, in the case of *Bommai v Union of India* (1994), 3SCC 1 elaborated the meaning of secularism. The Court said that secularism means equal treatment of all religions. The Court held that the word 'secular which was inserted in the Preamble of the Constitution by the 42nd Amendment, highlights the fundamental rights guaranteed in Articles 25-28. The Court also said that the neutrality of the State would be violated if religion is used for political purposes and any political party is using religion to achieve a political goal. Religion and politics should not be mixed. Although a secular state does not interfere in religious matters, it does not mean that the State has no say in all matters of religion. The State can make a law to regulate secular affairs of religious places. The Court followed this view in the case of *Ismail Faruqi v Union of India* (1994) 6SCC 3176, and held that any property belonging to a religious community could be acquired by the State under the *eminent domain*. Again in the case of *Aruna Roy v Union of India* (2002) 5SCC 368, Supreme Court of India held that the essence of secularism is non-discrimination of people by the State on the basis of religious differences.

In the case of *Abhiram Singh v. C D Commachem* (2017) 10 SCC 1, there was a question before the Court whether secularism means complete separation of religion from politics? The Court held that secularism does not say that the State should stay aloof from religion; instead, it should give equal treatment to every religion. Religion and caste are vital aspects of our society, and it is not possible to separate them completely from politics. The Court held that secularism is the basic structure of the Constitution and therefore cannot be amended. Secularism is derived from the cultural principle of tolerance and ensures the equality of all religions. No religion will be at risk in India because the Government would not be aligned to any religion. The Court also said that there is an essential connection between secularism and democracy and if we need that democracy should work properly and the marginalized group can avail the benefit, then there must be a secular state.



## **Secularism and its Reality in India**

Secularism is meaningful in a democratic country only when there is a core principle of equality. If there is no commitment towards equality, then there will be no commitment towards democracy. India is a secular state, and a secular State will not favor any religion; instead, it protects and preserves innate pluralism. A question may arise as to why there are special provisions in Articles 29 (Articles 29(1) & 29(2)) and 30 (Article 30(1)) of the Constitution to protect the language, script and culture of minorities. And also, it is said that India has been a secular State even before 1976 (before adding the word secular in Preamble), as prescribed by Articles 25 to 28, then why was the necessity felt to bring the 42<sup>nd</sup> Constitutional (Amendment) Act, 1976 and insert the word 'secular' in Preamble? This and the way the 42<sup>nd</sup> Amendment of the Constitution took place is a matter of debate because, at that very time, many opposition leaders were either in jail or underground, and the strength of opposition members in the Parliament was very few because of national emergency. It would have been better to clarify the meaning of secularism rather than inserting the word secular in the Preamble through this Amendment. One more debatable thing is that if a secular State is completely separated from religion and the law of such a country is also secular, then why are there different personal laws in the country? Why is there not only one law or Uniform Civil Code? In a secular country, the State will not discriminate between religions then why is there control of Government on many temples but not on mosques and churches? The Constitution of India prohibits using taxes for religious purposes, (Article 27) but for looking after the welfare of minorities, the Ministry of Minority Affairs has been created, which brings various schemes to provide financial assistance for minority religions. Haj subsidy was provided to Muslims, but no such subsidy was available for other religions. Now, this subsidy is stopped; before stopping it, the State was doing discrimination which was against the concept of secularism. In a secular state, there should not have been the question of majority and minority because all are the citizens of the same country. So, secularism in India is not like in many European countries. Undoubtedly in India, there is no theocracy, but there is hypocrisy.

As far as Secularism and Citizenship (Amendment) Act, 2019 (CAA) is concerned, it is a matter of debate; one group argues that this Act violates the Constitution as it is against the concept of secularism, whereas the Indian Government is saying that the Act is Constitutional. The argument of the group who is against the CAA is that it violates the concept of secularism because the Act grants citizenship to migrants belonging to Hindu, Sikh, Buddhist, Christian, Jain, and Parsi communities who came to the country from Pakistan, Bangladesh, and Afghanistan on or before December 31, 2014 but does not include Muslims in its purview. And also, it is discriminatory in nature as it violates Article 14 as well as Article 15(1) of the Constitution of India. Article 14 of the Indian Constitution clearly states that the State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India. It has been said that in this Article, the word person has been used, so it protects both citizens and non-citizens.

## Myth and Reality of Secularism in India: An Analysis

Article 15(1) provides that the State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth, or any of them. The Central Government's argument is that providing citizenship to anyone is a political matter and is neither against the concept of secularism nor discriminatory. As far as the question of the violation of Article 14 is concerned Supreme Court of India, in the case of *State of West Bengal v Anwar Ali Sarkar* (AIR 1952 SC 52) has held that Article 14 prohibits discrimination, but it permits reasonable classification. But the classification should be based on *intelligible differentia*, and the classification has nexus sought to be achieved. The CAA is an Act to protect people from religious persecution in three neighboring countries Pakistan, Bangladesh, and Afghanistan. All of them are Islamic states where radicalization is increasing day by day, and religious persecution is faced by Hindus, Sikhs, Buddhists, Jains, Parsis, and Christians. So the discrimination between Muslims and other religions is based on *intelligible differentia*. It has also been argued by the Central Government that Article 15(1) of the Constitution prohibits discrimination among the citizens of India and the Muslims of Pakistan Afghanistan and Bangladesh are not the citizen of India, so they cannot get the protection of Article 15(1) of the Constitution. Indian Government also said that CAA does not impinge upon any existing right that may have existed prior to the enactment of the Amendment and further, and no legal, democratic, or secular rights of any of the Indian citizens will be affected. Although the constitutionality of CAA has been challenged before the Supreme Court of India, the case is still pending.

### Conclusion

India is known as a secular nation across the world. Secularism *per se* means a mode of governance in which the State remains neutral in religious matters and is not supposed to tilt in favor of a particular religion. However, to protect the interest of minorities, specific provisions have been made in the Constitution, which indirectly reflects that specific discriminatory provisions have been made in the Constitution. In a secular state, majority and minority should be treated equally. Apart from the above, whenever the word minority was to be considered by the Government, the attention had been paid only to religious minority whereas the provision in the Constitution is 'religious and linguistic minority'. So, if the interest of minorities is going to be protected by the Government, then the constitutional meaning of minority should be taken into consideration; otherwise, the spirit of the Constitution will be defeated. In 2019 the Central Government brought the Citizenship (Amendment) Act, 2019 to protect the interest of six religions facing religious persecution in three neighboring countries but was strongly opposed by various groups saying that non-inclusion of Muslims in its purview is discriminatory and also against the concept of secularism which is the basic structure of the Constitution of India. And also, the basic structure of India cannot be changed. But one thing must be kept in mind that the basic structure theory was developed by the Supreme Court of India as a limitation in the power of Parliament to amend the Constitution. Normally a law that came through enactment cannot be challenged as violating the basic structure. CAA, 2019 is

not part of the Constitution so, it should not be challenged as violating the basic structure of the Constitution. The Supreme Court of India is the guardian of the Constitution, and whenever any danger comes to affect the secular character of the country, it is always ready to protect the secular character of the nation.

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Article 15(1) of the Constitution of India says “The State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them”.

Article 16(2) of the Constitution of India provides, “No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence or any of them, be ineligible for, or discriminated against in respect or, any employment or office under the State”.

Article 25(1) of the Constitution of India says; “Subject to public order, morality and health and to the other provisions of this Part, all persons are equally entitled to freedom of conscience and the right freely to profess, practice and propagate religion”.

Article 25(2) (a) of the Constitution of India says; “Nothing in this article shall affect the operation of any existing law or prevent the State from making any law regulating or restricting any economic, financial, political or other secular activity which may be associated with religious practice”

Article 25(2)(b) of the Constitution of India says; “Nothing in this article shall affect the operation of any existing law or prevent the State from making any law providing for social welfare and reform or the throwing open of Hindu religious institutions of a public character to all classes and sections of Hindus Explanation I The wearing and carrying of kirpans shall be deemed to be included in the profession of the Sikh religion Explanation II In sub clause (b) of clause reference to Hindus shall be construed as including a reference to persons professing the Sikh, Jaina or Buddhist religion, and the reference to Hindu religious institutions shall be construed accordingly”

Article 27 of the Constitution of India provides; “No person shall be compelled to pay any taxes, the proceeds of which are specifically appropriated in payment of expenses for the promotion or maintenance of any particular religion or religious denomination.”

Article 29(1) of the Constitution says; “Any section of the citizens residing in the territory of India or any part thereof having a distinct language, script or culture of its own shall have the right to conserve the same”.

Article 29(2) provides “No citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of State funds on grounds

## Myth and Reality of Secularism in India: An Analysis

only of religion, race, caste, language or any of them”.

Article 30 (1) of the Constitution of India states that the minorities in the country based on religion, languages have the right to establish educational institutions and also administer it according to their choice.

Article 30 (1) (A) of the Constitution states that the State has to keep in mind that the amount which is needed for the acquisition of the property does not exceed the budget of the community. Thus, it makes sure that the right which has been guaranteed under the clause is not restricted or abrogated.

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