

IMPORTANCE OF LIFESTYLE DURING KUMBH BATH AND KALPWAS IN PREVENTING COMMUNICABLE DISEASES

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Summary :

Background Periodical mass gathering is common in all cultures, but always linked to health hazards. The aim of the study was to explore the scientific basis based on natural active acquired immunity of fundamental principles of biological Pharmacy behind the traditional belief of Kumbh bath (Allahabad, India), claiming for providing immortal life in Hindu epics. In 2013, about 70 million people took bath between 14th January to 14th February) and several thousand stayed for a month, in camps of the river bank (*kalpwās*).

Methods In an observational study, 1000 volunteers (*Kalpwasis*) were registered and divided on the basis of their stay-duration (1 week to 4 weeks), their blood samples were taken and general health was observed also 760 samples were collected from five sites of river (Fig.1) at pre and post Kumbh Bath, Mainly six prominent bathing-days were selected for sampling namely Makar Sankranti, Paush Purnima, Mauni Amawasya, Basant Panchami, Maghi Purnima, Maha Shivratri, along with Pre-Kumbh and Post-Kumbh



Fig-1: Five sites of sample collection in pre and post Kumbh: Yamuna Control: S-I; Ganga Control: S-II; Sangam-I: S-III; Sangam-II: S-IV; After Sangam: S-V.

Findings Interestingly, none of them complained about bad health or any gastrointestinal problems. WBC counts (n=500) were normal and immunological tests (n=200), showed rising trend in IgA and IgM in proportion to stay-duration. Interestingly, IgG did not show significant change although some rise was recorded. The kidney and liver function tests (n=100) were in normal range, further supporting no untoward effect of *kalpwas*.

Physio-chemical characteristics of water samples such as The pH, EC, BOD, COD, DO, TDS, Turbidity, Ammonia, Fluoride, Alkalinity, Calcium hardness, Phosphate, Free chlorine, Total chlorine, Bromine, Phosphorus, Potassium, Sulphate, Nitrite, Nitrate and Magnesium hardness; trace elements like Iron, Zinc, Manganese, Copper, Cobalt, Selenium and toxic elements like Chromium, Cadmium, Lead and Arsenic were estimated. (Table 5)

The change in microbial population **was less than** 1.5 log units in samples collected from different bathing-sites at different events, described above. The diversity and evenness indices, calculated on the basis of carbon-source-utilization pattern community profiling, was increased during bathing events as compared to Pre-Kumbh sampling. Overall there were not much difference among bathing dates and sampling sites as well. The principal component analysis clearly demonstrated a shift in overall community patterns (site wise) in Sangam I, Sangam II and after sangam as compared to Ganga and Yamuna controls (Figure. 2).

Further, it was observed that after the processing of water samples various distinct types of plaques including small spherical, medium and large semi lunar irregular shapes and opaque morphology of plaques were present in Kumbha water, collected from various sites.

In this paper as we are discussing the IMPORTANCE OF LIFESTYLE DURING KUMBH BATH AND KALPWAS IN PREVENTING COMMUNICABLE DISEASES so relevant finding are considered and discussed.

Interpretation

Thus, at one hand, no epidemic or adverse effect to health was reported in Kumbh 2013, even after such a high mass gathering, on the other hand the microbial load of heterogeneous population was higher during bath. Although we have explored only 4 strains i.e. Pseudomonas, Coliforms, Fungi and Salmonella, but many more strains must be contributing to this microbial load (**Table 3**). The people bathing at Sangam area, are getting exposed to these novel microbes resulting immunological activation. However the immunological boost, although not highly significant, was observed suggesting a process of natural inoculation due to high inflow of inoculums, being carried by bathing flock, coming from different parts of the world to take holy bath. The results favor and support that the lifestyle in during kumbh bath and kalpwas boost immunity and prevent communicable diseases based on principle of natural active acquired immunity principle of biological pharmacy.

Key words: Mass-gathering, Kumbh mela of Allahabad 2013, immunological boosting, natural inoculation

Introduction

In all the religions, the periodical mass gatherings are common features. Some are small and some are very large such as Hazz. The epigenetics, noetic science, spiritual living, diet restrictions, psychological well being, social interaction and energy-healing therapy are some of the factors contributing factors for good health in such gatherings. Though the scientific evidences are lacking but the sustainability of such gatherings, since centuries, itself confirms their truthfulness.

The Ayurveda, a traditional system of medicine in India, advocates for balanced diet, good sleep with mental piece and restricted code of conduct as the basis of healthy life.¹ They may collectively influence the overall physiology of an individual, through management of oxidative stress, endoplasmic (ER) stress and pro-inflammatory processes, involved in pathogenesis of metabolic diseases, resulting disease free healthy life with high longevity. Although, direct evidences are lacking at present but tools of system biology may through some light to this observation.²

In India, *kumbh* bath is one such mass gathering of Hindus, similar to *haj* of Islam. Although earlier reports on Haj gathering have discouraged such mass gatherings due to bad health because of bad sanitation, seasonal factors, compromised diet-quality, noise-pollution and over-crowding³, but no such study is available regarding kumbh-gatherings, which is largest mass-gathering in the world. It is periodical mass gathering taking place, after 3 years gap, in 4 different places in India. This observational study is aimed to evaluate the health hazards/benefits of one of these kumbhs, took palace in Allahabad after gap of 12 years (*Maga-Kumbh*).

No such study has been conducted earlier. Here it has been hypothesized it induces immunological boosting, due to cross-inoculation, by microorganisms, carried out by large number of people, coming from different parts of the world to take a holy dip at confluence of Ganga, Yamuna and Saraswati rivers. These microorganisms get washed in the river and diluted to sub-pathogenic level. Thus, they fail to produce any infectious disease but act as natural inoculums.⁴

The periodical Kumbh festival takes place at Haridwar (Uttara-Khand), Allahabad in Uttar Pradesh, Ujjain in Madhya Pradesh and Nasik in Maharashtra. At 6th year it is called ardhakumbha and after 12 years it is Maha-Kumbh. This specific festival is always organized at Allahabad in winter season on specific dates, based on astronomical movement of *Sun* and *Kumbha* stars. The BBC reported that in 2013-kumbh, about 70 million people participated.⁵

As per Hindu mythology, it is an event of group bath, being organized on banks of tributaries of rivers. There are 4 main festivals viz. 'Makar-Sankrant', 'Amavasya (new moon day)', 'Vasant-Panchami' and Maghi Pournima, when maximum people take bath, as it is linked to special significance. According to few scholars, the kumbh festival started in 3464 BC, a tradition started about 1000 years prior to Harappa and Mohenjo-Daro culture of India. The famous Chinese traveler- Hiuen-Tsang mentioned about Kumbh Mela in 7th century itself.⁶

Besides the regular river bath, some people prefer to stay in tents on the bank the river, for a month. This is called as *Kalpwas* and the people observing this life style are called *Kalpwas*. They observe special code of conduct related to daily bath, spiritual discourses along with restricted food. The kalpwas provides an opportunity to (A) develop social network with co-inhabitants, coming from different regions of the world and unknown to each other; (B) to get mental and physical involvement in religious activities, through participation in camps of Yoga, drama, songs, lectures, meditation etc; (C) to get blessings from saints and elderly people (noetic effect) and (D) to develop confidence for living in physical hardship with disciplined life style.⁷ It induces the sense of well-being, shared identity, self-confidence, and supports from their fellow group-members, mutual trust, respect and cooperation finally modulating the biological-effects through process of changed psychoimmunology. Further, the religious attitude and practices also have positive impact on wellbeing.⁸⁻¹¹ It also provides physical endurance to live in cold and stress-full conditions with joy and happiness, which might be inducing protective heat shock proteins (HSPs).¹²⁻¹³

To test the hypothesis, we evaluated the immunological status of volunteers, who were randomly selected from the *kalpwas* camps. Their blood samples were analyzed for liver function, kidney function, hematological changes and levels of IgG, IgA and IgM and analyzed by appropriate statistical tools.

Material and methods

Persons of both sexes, observing *kalpwas*, were randomly selected. Questionnaire, related to their life style, history of past illness and anthropometric measurements were filled. The selected population was classified on basis of sex, age and geographical distribution of their home address. After their written consent, blood samples were collected in heparinized and plain tubes. The 1st tube was immediately shipped to the clinical pathology laboratory of Smt Kamla Nehru Hospital, a constituent of Govt Medical College, Allahabad for blood hematology. The 2nd tube

was centrifuged in our camp laboratory for separation of serum. It was then transferred to -80C freezer for various analysis. The status of immunoglobulins (Ig-G, IgM and IgA) was carried out by ELISA kits in dept of Pathology, IMS, BHU. (Roche diagnostic USA kit for- Urea, creatinine, SGOT, SGPT analysis instrument name- Cobas integra 400 plus (Roche diagnostic) spinreact kit (Ark diagnostic pvt. ltd. INDIA) for- IgG, IgA, IgM) The kidney and liver function tests were carried out in SS hospital, BHU by using auto-analyzer.

760 samples were collected from five sites of river at pre and post Kumbh Bath, Mainly six prominent bathing-days were selected for sampling namely Makar Sankranti, Paush Purnima, Mauni Amawasya, Basant Panchami, Maghi Purnima, Maha Shivratri, along with Pre-Kumbh and Post-Kumbh and all studies regarding microbial load and physico-chemical study were carried at CSIR- National Botanical Research Institute by the expert scientists.

Statistical analysis

Variability was assessed using ANOVA procedures using SPSS (VERSION 19). Data were expressed as mean \pm SD. $p < 0.05 = *$, $p < 0.01 = **$, $p < 0.001 = ***$, $p > 0.05$. Asterisks indicate significant differences. *P* Values of less than 0.05 were considered statistically significant. The studies about the heterogeneous population and other bacterial load were assessed on statistically significant values.

Results

Interestingly, no abnormalities were detected in renal function, liver function and hematological parameters, suggesting no adverse effect of food and environmental toxins during 1 month *kalpwas* (Table-1). The volunteers also had no complaints of any gastro-intestinal (GI) related problems and general well being. Interestingly, the IgA values showed significant change ($P < 0.001$) in 4 weeks (Table-2). It showed gradual rise from 210 mg%, (N=95) in 1st week to 260.7 mg%, (N=26) in 4th week. The changes in IgM were biphasic, as it was highest in 1st week (106.3 mg%, N=95), followed by decrease in 2nd week (84.15 mg%, n=21) and then again rise in the 4th week. However, IgG levels did not show significant change, though, rising trend was noted. It raised from 1296 mg% to 1303 mg% in 2nd week but comparatively reduced on 4th week, but still remained higher than the initial values. Thus, it could be suggested that during *kalpwas* (30 days stay) the immune system gets modulated in *kalpwasies*.

Discussion

Serum GOT/GPT and urea/creatinine are routine biochemical parameters to assess liver function and kidney function respectively. They are raised in case of any abnormality such as intake of hepatotoxic foods/drugs or factors responsible for acute renal toxicity. GI upset is also routine when taking unhygienic foods. These factors are very common in mass gathering³, but no such symptoms were noted in this observational study indicating proper arrangement in this kumbh festival. This could be attributed to Government initiatives and also due to presence of several Non-profit organizations and spiritual camps, involved in providing food and basic amenities to pilgrims. The psychological status of each kalpwas shows their highly enthusiastic mood full of confidence to attain blessings of God and other saints, present in various camps, extending spiritual discourses. This confidence may result to psychological strength for fighting against

untoward living conditions in camps. It may also induce psychological immunological boosting, described earlier.⁸⁻¹¹

There could be many factors, contributing the rise in IgA such as physical activity¹⁴, mental stress¹⁵ and activation of mucosa associated lymphoid tissue¹⁶ and psychological status.¹⁷⁻¹⁸ These factors are commonly found in all kalpwasis as they observe strict code of conduct for early-morning bathing, God worshipping, listening spiritual discourses in different camps, spread over several miles on the bank of the river. Living away from their homes and worrying about their household and official problems, when staying in camps gives a kind of mental stress, especially in early days of kalpwas. On later days they may get accustomed to that kind of new spiritual life style.¹⁹⁻²¹ Since gut is the main organ rich in mucosa associated lymphoid tissue and they are continuously being exposed to new microbes through drinking water, so there is possibility of more IgA production, as we have found in our volunteers.

Rise in microbial load has been observed in flowing water of confluence area of river. These changes were varying in proportion to population load, taking bath. This is expected as millions of people are coming from different parts of the world to take bath in restricted area of confluence. These pilgrims might be carrying some kind of novel-microbes with them. These may be novel to others, because of diversity of microbes (Figure 2). These microbes may get washed-off during bathing and attains very dilute concentration, thereby raising the microbial load in water of that area. Thus people taking bath during kumbh bath and kalpwas are exposed to naturally occurring new pathogenic microbes enhance the immunity against the microbes responsible for communicable diseases on the basis of fundamental principle of natural active acquired immunity of biological pharmacy. Since the dilution is very low in sup-pathological concentration, so no report of spreading of any infectious-disease was registered. This rise in immunoglobulin is consistent to earlier reports, where nasal spray or oral vaccination has been reported to stimulate mucosal immunity.¹⁶ The role of chronic infection or liver disease behind the rise of IgA is ruled out, because liver function, kidney functions and WBC counts did not change during 30 days stay.

Besides the exposure to novel microbes, the immunological changes due to psychological effects may not be ruled out. These kalpwasis develop a sense of a 'social safety net' and self confidence to confront newer challenges during living in odd conditions.²¹ They get a crowd experience, which gives a bubbling excitement, happiness and positive emotions (coined as '*effervescence*' the 'joy of crowds' by a French sociologist Emile Durkheim), which may result to immunological boosting.¹⁹⁻²¹ This is consistent with earlier reports related to psychopharmacology and meditation with immune status.¹⁷⁻²⁰ Thus feeling of strong faith in God, friendship and collective living in kalpwasi along with higher immune activity (as discussed above) may collectively give better health and defense cover for time to come in future.

Interestingly the rising trend in granulocytes was also observed in these kalpwasis, which suggests the activation of innate immunity. Lymphocytes did not show any change, same as the level of IgG, suggesting not much activation of humoral immunity. It is reported that acute infections raises the IgM reactivity, whereas chronic infections raise the IgG reactivity.²² In fact, after 5 days of microbial exposure, IgM is detectable which peaks within 10 days and then declines, followed by rise in IgG.²³ Since we are not getting raised IgM, in samples collected

from volunteer on later days of kalpwas, so chances of systemic infection is ruled out. This is also supported by no change in IgG level on later days.

This observational pilot study suggests that Kumbh festival held at Allahabad in 2013, one of the largest mass gatherings of the world, did not show any untoward health hazards. It also induced immunological boosting in people observing 30 days kalpwas, (living in camps on the river bank and observing spiritual life). This could be a case of natural immunization, which needs further long term studies.

Author's contribution

The author's are equally contributed.

Conflict of interest

The authors declare no conflict of interest.

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Table-1: Biochemical parameters of random samples collected during 30 days stay of kalpwasi.

S.N	Parameters	Mean \pm SD, (n)
1	HB	12.082 \pm 1.4015, (480)
2	Platelets (10^3)	234.97 \pm 72.68, (480)
3	Lymphocytes (10^3)	2.084 \pm 0.62, (480)
4	Granulocytes (10^3)	4.88417 \pm 1.29, (480)
5	SGOT	28.49 \pm 17.16, (85)
6	ALP	92.948 \pm 39.38, (85)
7	Urea	25.0780 \pm 11.17, (85)
8	Creatinine	0.3014 \pm .13, (85)
9	IgG	1312.9 \pm 189.05, (209)
10	IgM	102.18 \pm 41.31, (209)
11	IgA	228.92 \pm 68.21, (209)

Table-2: Effect of Kalpwasi on immunological status

SN	Immunoglobulins	Mean \pm SD (n)
1	IgG	1312.9 \pm 189.05, (209)
2	IgM	102.18 \pm 41.31, (209)
3	IgA	228.92 \pm 68.21, (209)

Table 3: Microbial population depicting overall effect of mass ritualistic bathing on different sites and events i.e. Pre-Kumbh (A), Makar Sankranti (B), Paush Purnima (C),

	Heterogeneous	Pseudomonas	Coliforms	Fungi	Salmonella
	Log ₁₀ CFU/ml				
	YC				
A	4.70±0.03	4.14±0.08	1.86±0.05	1.65±0.09	1.84±0.04
B	5.11±0.01	3.86±0.02	1.68±0.14	1.42±0.06	2.37±0.06
C	5.12±0.02	4.86±0.08	1.82±0.06	1.86±0.02	2.58±0.05
	GC				
A	4.75±0.02	3.90±0.03	1.68±0.10	1.56±0.04	1.79±0.06
B	4.95±0.01	3.79±0.17	2.01±0.14	1.46±0.09	2.07±0.05
C	4.99±0.04	4.59±0.03	1.46±0.09	1.54±0.16	2.39±0.01
	SI				
A	4.63±0.05	3.68±0.19	1.46±0.09	1.46±0.09	1.46±0.09
B	5.15±0.01	3.95±0.06	1.79±0.06	1.59±0.15	1.90±0.03
C	5.01±0.02	4.60±0.02	2.28±0.05	1.26±0.14	2.70±0.01
	SII				
A	4.74±0.03	3.99±0.05	1.75±0.05	1.42±0.06	1.63±0.03
B	5.15±0.03	3.93±0.05	1.83±0.07	1.30±0.00	2.16±0.09
C	5.09±0.01	4.83±0.02	2.28±0.05	1.32±0.16	2.21±0.02
	AS				
A	4.82±0.01	3.92±0.05	1.88±0.04	1.56±0.04	1.84±0.04
B	5.24±0.03	3.94±0.03	2.29±0.05	1.36±0.06	2.10±0.02
C	5.24±0.02	4.37±0.02	2.18±0.02	1.59±0.15	2.68±0.03

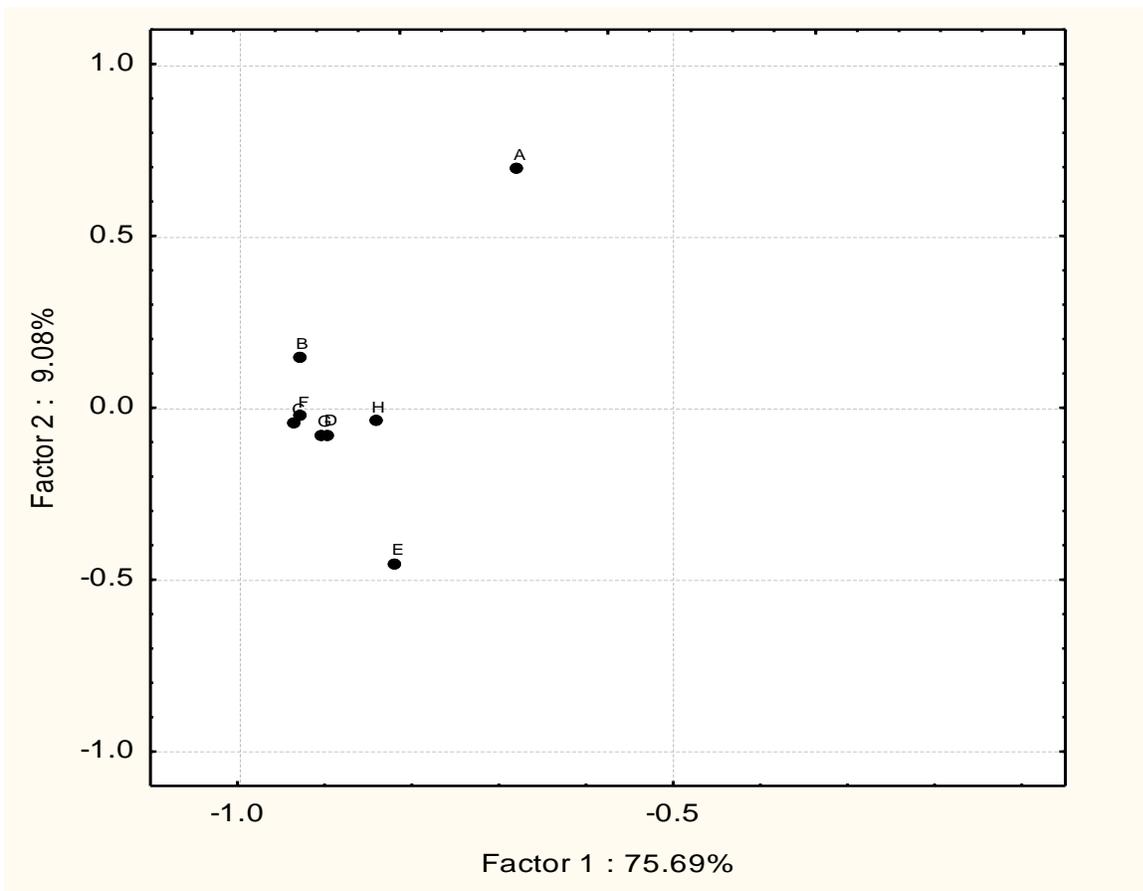


Figure 2: Principal component analysis based on carbon source utilization pattern depicting overall effect of mass ritualistic bathing on different events i.e. Pre-Kumbh (A), Makar Sankranti (B), Paush Purnima (C), Mauni Amawasya (D), Basant Panchami (E), Maghi Purnima (F), Maha Shivratri (G), Post-Kumbh (H).

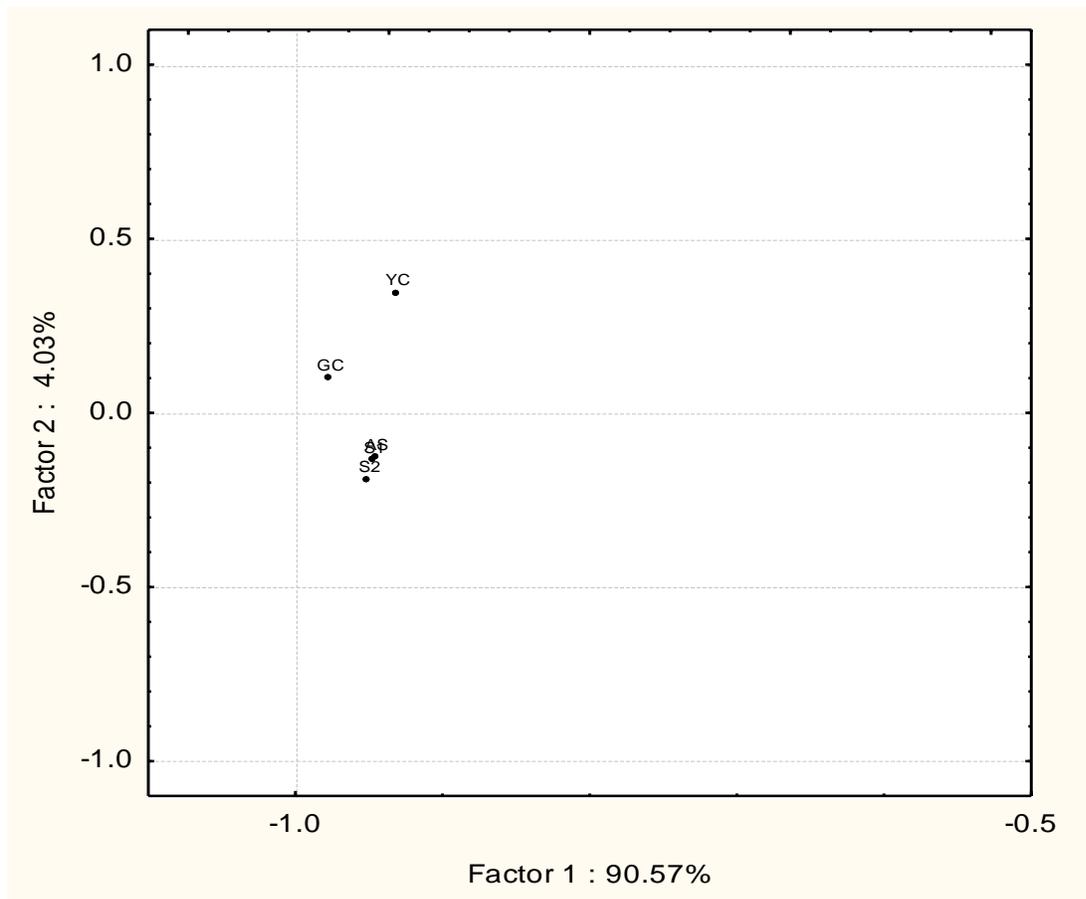


Figure 2 (A-B): Principal component analysis based on carbon source utilization pattern depicting overall effect of mass ritualistic bathing on different sites (i.e. Yamuna Control (YC), Ganga Control (GC), Sangam I (S-I), Sangam II (S-II), After Sangam AS);

Table 4: Diversity and Evenness indices based on carbon source utilization pattern depicting overall effect of mass ritualistic bathing on different sites and events i.e. Pre-Kumbh (A), Makar Sankranti (B), Paush Purnima (C),

Event s	Shannon diversity	Shannon evenness	Simpson diversity	McIntosh diversity	McIntosh evenness
YC					
A	3.079±0.04 5	0.902±0.016	0.977±0.004	0.935±0.010	0.937±0.011
B	3.103±0.05 7	0.909±0.014	0.981±0.003	0.946±0.009	0.948±0.008
C	2.937±0.06 5	0.869±0.009	0.967±0.003	0.911±0.008	0.916±0.004
GC					
A	2.627±0.09 3	0.798±0.032	0.935±0.013	0.845±0.024	0.859±0.026
B	3.018±0.04 9	0.890±0.016	0.974±0.004	0.926±0.010	0.931±0.010
C	2.984±0.00 9	0.878±0.009	0.974±0.001	0.927±0.001	0.931±0.004
SI					
A	2.395±0.29 3	0.759±0.070	0.890±0.051	0.778±0.077	0.805±0.070
B	3.243±0.03 2	0.957±0.007	0.990±0.002	0.971±0.005	0.975±0.004
C	3.159±0.01 7	0.929±0.005	0.984±0.001	0.953±0.003	0.957±0.003
S II					
A	2.632±0.07 8	0.791±0.016	0.934±0.010	0.842±0.019	0.852±0.015
B	3.102±0.03 4	0.921±0.007	0.983±0.002	0.949±0.005	0.956±0.003
C	3.192±0.00 9	0.948±0.004	0.988±0.000	0.963±0.000	0.970±0.002
AS					
A	2.453±0.14 0	0.783±0.023	0.915±0.018	0.808±0.030	0.838±0.021
B	3.085±0.04 9	0.913±0.008	0.980±0.003	0.942±0.007	0.948±0.004
C	3.085±0.04 9	0.913±0.008	0.980±0.003	0.942±0.007	0.948±0.004

Table 5: Impact of mass bathing on BOD (mg l⁻¹) of Kumbh water at Allahabad.

Sites	BOD (mg l ⁻¹)			COD (mg l ⁻¹)		
	Pre-Kumbh	Makar Sankranti	Paush Purnima	Pre-Kumbh	Makar Sankranti	Paush Purnima
YC	2.16±0.26	2.10±0.27	2.24±0.34	11.65±1.87	12.21±1.67	12.95±1.78
GC	4.89±0.12	5.78±0.81	6.19±0.62	26.50±1.21	32.80±0.81	35.40±1.21
S-1	5.57±0.37	6.19±0.36	6.86±1.03	31.50±1.38	35.60±2.37	40.30±2.36
S-2	5.45±0.26	7.53±0.45	7.95±0.32	32.50±3.27	42.80±4.46	47.50±2.29
AS	4.19±0.40	5.04±0.14	5.20±0.16	25.60±2.41	31.60±2.84	29.60±3.16

Level of different heavy metals at S-1 site at different time points of kumbh bath

	Cadmium (µg l ⁻¹)	Lead (µg l ⁻¹)	Arsenic (µg l ⁻¹)
Pre-Kumbh	1.04±0.06	1.91±0.34	7.97±0.61
Makar Sankranti	2.20±0.10	0.31±0.21	13.38±0.28
Paush Purnima	2.81±0.06	0.33±0.04	7.64±0.28
Mauni Amawasya	BDL	BDL	8.11±0.90
Basant Panchami	BDL	BDL	6.77±0.90
Magh Purnima	BDL	BDL	6.59±0.36
Mahashivratri	BDL	BDL	7.44±0.31
Post Kumbh II	0.74±0.06	2.18±0.57	10.86±0.44