Research Article

Effect of Suryanamaskar Practice on Skin Microbiome in Healthy Individuals–An Exploratory Clinical Study

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Abstract

Introduction: Suryanamaskar is a collection of twelve asanas that can be done systematically. Every cell in the body is revitalized and regenerated when Suryanamaskar is practiced. Yoga, in particular, is a better way to modify lifestyle where it can heal our microbiome through stress reduction, gentle exercise and in aiding digestion. As a gentle exercise practice, Suryanamaskar has the potential to support a flourishing and diverse microbiome.

Aim: To assess the role of Suryanamaskar practice in human skin microbiome.

Objectives of the study: To study the effect of Suryanamaskar practice on human Skin Microbiome in apparently healthy individuals. To compare the difference in human microbiome between practitioners and non-practitioners of Suryanamaskar in apparently healthy individuals.

Materials and Methods: 20 Male healthy individuals in the age group of 20-40 years were randomly divided into two groups of 20 each. Group-A received 2 months practice of Suryanamaskar while Group-B not at all practicing Suryanamaskar.

Results: Practice of Suryanamskar produced an increase in the skin microbiome diversity in the Group-A as compared to Group-B. Discussion: The overall effect on health assessment criteria shows good results in the Group-A. Skin microbiome richness and diversity increased in Group-A as compare to Group-B.

Conclusion: The present study shows practice of Suryanamaskar has positive benefits as evidenced by improvement of skin microbiomes in healthy individuals.

Keywords: Yoga; Suryanamaskar; Healthy individual; Skin; Microbiome; Bacteria

Introduction

Suryanamaskar (SN) is a fundamental component of current yoga practice [1]. According to the Vedas, Suryanamaskar has to be performed on a regular basis, as a salutation to the rising sun. Suryanamaskar, consists of twelve asanas and is provide multiple health advantages for various bodily systems [2]. Suryanamaskar, often known as the 'sun salutation' is a series of dynamic postures that is neither an Asana nor a component of traditional Yoga. The Ramayana's "Aditya Hrudayam" teaches the sun salute with chants that are comparable to the modern Suryanamaskar. Suryanamaskar has been a popular type of physical exercise both in India and the West in recent years and its health advantages have been thoroughly documented through various researches conducted on it [3]. Suryanamaskar is a type of yoga that helps the body's musculo-skeletal system, as well as its internal organs, to function normally and effectively. Suryanamaskar also increases intestinal peristalsis movement, blood flow in the body, stimulates and tones the kidneys, allows wastes to be easily eliminated from the body with ease and helps the body eliminate toxins through increased sweating. Toxin elimination is a crucial part of keeping skin healthy and avoiding skin problems [4].

Skin, as the body's biggest organ, is inhabited by beneficial microbes and acts as a physical barrier against disease invasion. The skin microbiota is made up of millions of bacteria, fungi, and viruses that live on our skin. Skin microorganisms, like those in our gut, play an important role in protecting us from invading infections, developing our immune system and breaking down natural products. Skin disease or even systemic disease can occur when the barrier is destroyed or when the balance between microflora and pathogens is disrupted. The physiological properties of human skin sites, such as whether they are sebaceous (oily), wet or dry can be used to classify them [5]. External irritants (e.g., pressure, shock, UV light, chemicals, and infections) are protected by skin, which also functions to keep fluid within the body. It is now well accepted that the skin is a key to preventing skin ailments because it is made up of microorganisms as well as the "wall" of skin cells. *Cutibacterium* (previously *Propionibacterium*) acnes is known to create fatty acids, which keep skin pH moderately acidic and prevent the colonization of transitory bacteria. Staphylococcus epidermidis is a major source of glycerol on the skin, which is responsible for skin water retention [6].

Objectives of the study:

- To study the effect of Suryanamaskar practice on human Skin Microbiome in apparently healthy individuals.
- To compare the difference in human microbiome between practitioners and non-practitioners of Suryanamaskar in apparently healthy individuals.

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Materials and Methods

The Literary data was collected from classical texts of Yoga, Library, Research articles, Dissertations and Internet sources. The healthy individuals attending the OPD of Swasthavritta and Yoga at KLE BMK Ayurveda Hospital, Belagavi Karnataka were recruited in the study. All chemicals required for the study was procured from standard pharmaceutical companies.

After approval from Institutional Ethical Committee (IEC), The healthy persons, who fulfilled the healthy parameters mentioned in inclusion criteria was selected and randomly divided into two groups ie, Group-A and Group-B with help of "Random Number Generator". Informed written consent was taken from the subjects. Evaluation of subjective and objective parameters was done before and after the intervention with the help of pre-formed parameters.

Study design

An Exploratory Clinical Study

Study type

Interventional

Screening criteria to select Swastha person

The healthy male persons, irrespective of religion were selected from Swastha OPD of KLE Ayurveda Hospital and Research Centre, Shahapur Belagavi, who fulfills the "Signs of Health" under 'Arogya linga' (Parameters to assess health) explained in Kashyapa Samhita.

Inclusion criteria

- Healthy male persons of age group 20 to 40 years, showing 'Signs of Health' under "Arogya linga explained in 'Kashyapa Samhita' were included.

Exclusion criteria

- Subjects not fulfilling signs of health, female subjects (because of not able to perform Suryanamaskara practice during menstrual period) and history of active sports training and previous history of yoga training were excluded.
- History of major medical illnesses such as Tuberculosis, Cardiac ailments, hypertension, Diabetes mellitus, history of Bronchial asthama and history of major surgery in the recent past were excluded (Table 1).

Assessment criteria

The assessment was based on the following subjective and objective parameters.

Subjective parameters

Based on "Arogya" linga explained in Kashyapa samhita and they are as follow.

- Annabhilasha (Desire for food)
- Bhuktasya paripaaka (Easy digestion of food)
- Srusta vin-mootra-vatatwa (Excretion of feces urine and flatus)
- Shareerasya laghavam (Lightness of body)
- Suprasnnendriyatwa (Perspicuity of Indriyas)
- Sukha-swapna prabodanam (Comfortable sleep and awakening)
- Soumanasya (Happiness) (Table 2)

Objective parameters

Skin sweat sample.

Collection of source of Samples: The samples were collected from the upper back region with help of sterile swab stick.

Bacterial Count: The method used for bacterial count was colony counting method.

Results

Effect of Suryanamaskara practice on "Annabhilasha" (Desire of food)

There was increase in Annabhilasha (Desire of food) in subjects of Group-A which was significant at 0.0150 with Standard Deviation of 0.5. There was decrease in Annabhilasha in subjects of Group-B, which was significant at 0.002 with Standard Deviation of 0.7 (Table 3).

Table 1: Shows groups and interventions.

Groups	Intervention	Pattern of Suryanamaskara	Completing time of one round of Suryanamaskara	No. of performance of Suryanamaskara practice	Duration
Group-A n=10	Healthy individuals, practicing Suryanamaskara daily	12 posture pattern	2 minutes	12 rounds in 25 minutes	2 months
Group-B n=10	Only healthy individuals, not at all Practicing Suryanamaskara	-	-	-	2 months

Table 2: Shows self-assessment grading.

Annabhilasha (Desire for food)	Timely manifestation of hunger	Grade 0
	Occasional loss of interest	Grade 1
	Disinterested to food always	Grade 2

Bhuktasya paripaaka (Easy digestion of food)	Easy digestion of food	Grade 0
	Occasional disturb in digestion	Grade 1
	Always feel indigestion	Grade 2
Srustavin-mootra-vatatwa (Excretion of feces urine and flatus)	Normal	Grade 0
	Occasional disturbance	Grade 1
	Untimely and disturbed	Grade 2
Shareerasya laghavam (Lightness of body)	Feels lightness enthusiastic	Grade 0
	Occasional disturbance	Grade 1
	Feels heaviness and laziness	Grade 2
Suprasnnendriyatwa (Perspicuity of indriyas	Natural function of Indriyas	Grade 0
	Mild Impairment	Grade 1
	Impairment	Grade 2
Sukhaswapna-prabodanam (Comfortable sleep and awakening)	Normal manifestation	Grade 0
	Occasional delay	Grade 1
	Continuous disturbance	Grade 2
Soumanasya (Happiness)	Feels happiness and cheerful	Grade 0
	Occasional fluctuation	Grade 1
	Always depress and disturbed	Grade 2

Table 3: Shows effect of Suryanamaskara practice on "Annabhilasha" (Desire of food).

	Group-A				Group-B						
Treatment	**Mean**	**SD**	**Median**	**IQR**	**Mean**	**SD**	**Median**	**IQR**	**U-value**	**Z-value**	**p-value**
Before	1.2	0.4	1	0.3	0.6	0.5	1	1	24	-2.439	0.0150*
After	0	0	0	0	0.9	0.7	1	1.3	15	-3.139	0.0020*

Table 4 shows within the Comparison of before and after SN status of Annabhilasha (Desire of food) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Annabhilasha (Desire of food) (p=0.0051) with rate of increment 100% whereas Group B showed not significant and decrease in the status of Annabhilasha (Desire of food), (p=0.1088) and rate of increment was -50%.

Group A-There was increase in Bhuktasya Paripaaka (Easy digestion of food) of subjects which was significant and where mean was 0.0 with SD of 0.0.

Group B-There was decrease in Bhuktasya Paripaaka (Easy digestion of food) of subjects which was significant where mean was 0.7 with SD of 0.8.

Table 5 shows within the Comparison of before and after SN status of Bhuktasya Paripaaka (Easy digestion of food) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Bhuktasya Paripaaka (Easy digestion of food), (p=0.0077) with rate of increment 100% whereas Group B showed not significant and decrease the status of Bhuktasya Paripaaka (Easy digestion of food), (p=0.3613) and rate of increment was -16.67%.

Table 6 shows in Between Comparison of Group A and Group B with before and after SN status of Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus) by Mann-Whitney U test:

Group A-There was increase in Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus) of subjects which was significant and where mean was 0.0 with SD of 0.0.

Group B-There was decrease in Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus) of subjects which was significant where mean was 0.7 with SD of 0.5.

Table 7 shows within the Group of before and after SN status of Srusta vin-mootra-vatatwa (Excretion of faeces, urine and flatus) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus (p=0.0051) with rate of increment 100% whereas Group B showed also significant and but decrease the status of Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus), (p=0.3613) and rate of increment was -75%.

Table 4: Shows within the comparison of before and after SN status of Annabhilasha (Desire of food) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	100	2.8031	0.0051*
Group B	Before to after	-50	1.6036	0.1088

Table 5: Shows in between comparison of Group A and Group B with before and after SN status of Bhuktasya Paripaaka (Easy digestion of food).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	1.5	0.7	2	1	0.6	0.5	1	1	17	-2.677	0.0070*
After	0	0	0	0	0.7	0.8	0.5	1.3	25	-2.492	0.0130*

Table 6: Shows within the comparison of before and after SN status of Bhuktasya Paripaaka (Easy digestion of food) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	100	2.6656	0.0077*
Group B	Before to after	-16.67	0.9129	0.3613

Table 7: Shows in between comparison of Group A and Group B with before and after SN status of Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	0.6	0.7	0.5	1	0.4	0.5	0	1	43	-0.602	0.547
After	0	0	0	0	0.7	0.5	1	1	15	-3.199	0.0010*

Table 8 shows in Between Comparison of Group A and Group B with before and after SN status of Shareerasya laghavam (Lightness of body) by Mann-Whitney U test:

Group A-There was increase in Shareerasya laghavam (Lightness of body) of subjects which was significant and where mean was 0.2 with SD of 0.4.

Group B-There was decrease in Srusta vin-mootra-vatatwa (Excretion of faeces urine and flatus) of subjects which was significant where mean was 1.4 with SD of 0.8.

Table 9 shows within the Group of before and after SN status of Shareerasya laghavam (Lightness of body) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Shareerasya laghavam (Lightness of body) (p=0.0051) with rate of increment 90% whereas Group B showed not significant and decrease the status of Shareerasylaghavam (Lightness of body), (p=0.5930) and rate of increment was 6.67%.

Group A-There was increase in Suprasnnendriyatwa (Perspicuity of Indriyas) of subjects which was significant and where mean was 0.1 with SD of 0.3.

Group B-There was decrease in Suprasnnendriyatwa (Perspicuity of Indriyas) of subjects which was significant where mean was 1.3 with SD of 0.8.

Table 10 shows within the Comparison of before and after SN status of Suprasnnendriyatwa (Perspicuity of Indriyas) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Suprasnnendriyatwa (Perspicuity of Indriyas) (p=0.0077) with rate of increment 92.86% whereas Group B showed not significant and decrease the status of Suprasnnendriyatwa (Perspicuity of Indriyas), (p=0.5286) and rate of increment was -18.18%.

Table 11 shows in Between the Comparison of Group A and Group B with before and after SN status of Sukha-swapna-prabodanam (Comfortable sleep and awakening) by Mann-Whitney U test:

Group A-There was increase in Sukha-swapna-prabodanam (Comfortable sleep and awakening) of subjects which was significant and where mean was 0.3 with SD of 0.5.

Group B-There was decrease in Sukha-swapna-prabodanam (Comfortable sleep and awakening) of subjects which was significant where mean was 1.3 with SD of 0.7.

Table 12 shows within the Comparison of before and after SN status of Sukhaswapna-prabodanam (Comfortable sleep and awakening) in Group A and Group B by Wilcoxon matched pairs test:

Table 8: Shows within the group of before and after SN status of Srusta vin-mootra-vatatwa (Excretion of faeces, urine and flatus) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	100	2.8031	0.0051*
Group B	Before to after	-75	2.0304	0.0423*

Table 9: Shows in between comparison of Group A and Group B with before and after SN status of Shareerasya laghavam (Lightness of body).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	2	0	2	0	1.5	0.7	2	1	30	-2.169	0.0300*
After	0.2	0.4	0	0.3	1.4	0.8	2	1.3	14	-2.966	0.0030*

Table 10: Shows within the Group of before and after SN status of Shareerasya laghavam (Lightness of body) in Group A and Group B.

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	2	0	2	0	1.5	0.7	2	1	30	-2.169	0.0300*
After	0.2	0.4	0	0.3	1.4	0.8	2	1.3	14	-2.966	0.0030*

Table 11: Shows within the Group of before and after SN status of Shareerasya laghavam (Lightness of body) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	90	2.8031	0.0051*
Group B	Before to after	6.67	0.5345	0.593

Table 12: Shows in between the comparison of Group A and Group B with before and after SN status of Suprasnnendriyatwa (Perspicuity of Indriyas).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	1.4	0.7	1.5	1	1.1	0.6	1	0.3	36.5	-1.147	0.251
After	0.1	0.3	0	0	1.3	0.8	1.5	1.3	12.5	-3.146	0.0020*

Within the group, Group A showed significant improvement in Sukhaswapna-prabodanam (Comfortable sleep and awakening), (p=0.0284) with rate of increment 75% whereas Group B showed not significant and decrease the status of Shareerasylaghavam (Lightness of body), (p=0.5002) and rate of increment was -18.18%.

Table 13 shows in between Comparison of Group A and Group B with before and after SN status of Soumanasya (Happiness) by Mann-Whitney U test:

Group A-There was increase in Soumanasya (Happiness) of subjects which was significant and where mean was 0.0 with SD of 0.0.

Group B-There was decrease Soumanasya (Happiness) of subjects which was significant where mean was 0.8 with SD of 0.4.

Table 14 shows within the Comparison of before and after SN status of Soumanasya (Happiness) in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant improvement in Soumanasya (Happiness) (p=0.0077) with rate of increment 100% whereas Group B showed not significant and decrease the status of Soumanasya (Happiness), (p=0.3613) and rate of increment was -33.33%.

Table 15 shows in Between the Comparison of Group A and Group B with before and after SN status of CFU counts in Skin microbiome by Mann-Whitney U test:

In between the groups, there was significant difference between the groups with p value 0.0017 with mean value of Group A was 6380 with SD 2104.9 while Group B mean value was 2620 with SD 2389.

Table 16 shows within the Comparison of before and after SN CFU counts in Skin microbiome in Group A and Group B by Wilcoxon matched pairs test:

Within the group, Group A showed significant increase in CFU count (p=0.0069) whereas Group B showed decrease for the same with no significance (p=0.1394) (Table 17-19).

Table 13: Shows within the comparison of before and after SN status of Suprasnnendriyatwa (Perspicuity of Indriyas) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	92.86	2.6656	0.0077*
Group B	Before to after	-18.18	0.6301	0.5286

Table 14: Shows in between the comparison of Group A and Group B with before and after SN status of Sukha-swapna-prabodanam (Comfortable sleep and awakening).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	1.2	0.6	1	1	1.1	0.6	1	0.3	45.5	-0.404	0.687
After	0.3	0.5	0	1	1.3	0.7	1	1	14	-2.924	0.0030*

Table 15: Shows within the comparison of before and after SN status of Sukhaswapna-prabodanam (Comfortable sleep and awakening) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	75	2.1917	0.0284*
Group B	Before to after	-18.18	0.6742	0.5002

Table 16: Shows in between comparison of Group A and Group B with before and after SN status of soumanasya (happiness).

Treatment	Group A				Group B				U-value	Z-value	p-value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Before	1	0.5	1	0	0.6	0.5	1	1	32	-1.697	0.09
After	0	0	0	0	0.8	0.4	1	0.3	10	-3.559	0.0001*

Table 17: Shows within the comparison of before and after SN status of Soumanasya (Happiness) in Group A and Group B.

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	100	2.6656	0.0077*
Group B	Before to after	-33.33	0.9129	0.3613

Table 18: Shows in between the comparison of Group A and Group B with before and after SN status of CFU counts in Skin microbiome.

Treatment	Group A			Group B			U-value	Z-value	P-value
	Mean	SD	Mean rank	Mean	SD	Mean rank			
Before	3270	1876.8	11.7	2850	2504.3	9.4	38.5	0.8315	0.4057
After	6380	2104.9	14.4	2620	2389.2	6.7	11.5	2.8725	0.0041*
Difference	3110	1893.5	14.7	-230	466.8	6.3	8	3.1371	0.0017*

Table 19: Shows within the comparison of before and after SN CFU counts in Skin microbiome in Group A and Group B

Groups	Changes from	% of change	Z-value	p-value
Group A	Before to after	-95.11	2.7011	0.0069*
Group B	Before to after	8.07	1.478	0.1394

Discussion

Discussion on composition of the skin microbiota

Bacteria that survive in humid conditions, such as Staphylococcus and Corynebacterium species, were found in higher concentrations in wet locations, such as the bends of the elbows and the soles of the feet. Unlike bacterial communities, the composition of fungal communities remained consistent throughout central body regions regardless of physiology [7,8]. *Malassezia* spp. colonized the core body and arm locations, whereas *Malassezia* spp, *Aspergillus* spp, *Cryptococcus* spp, *Rhodotorula* spp, *Epicoccu*m spp, colonized on foot sites. Bacteria have been the most common kingdom across all sites, while fungi were the least common [9].

Firmicutes, *Bacteroidetes*, *Proteobacteria* and *Actinobacteria* are the four phyla of bacteria that live on the skin. Microorganisms and their collective DNA reside in an anatomical niche, making up the human microbiome. The skin microbial composition is highly variable in each individual and is influenced by the local micro-environment of the specific skin spot. Moist *versus* dry skin patches" are likely as biologically distinct according to studies of variety among human body sites. Studies have identified three broad micro-environment types with distinct microbial communities such as sebaceous areas (in which Propionibacteria species and Staphylococci species predominate), humid areas (in which *Corynebacteria* species predominate, with *Staphylococci* also present) and temperate climates (with mixed populations and a higher incidence of *Proteobacteria* and *Flavobacteriale*) [10]. *Staphylococcus epidermidis*, a member of the Firmicutes, accounts for more than 90% of all aerobic resident microbiota and has a number of mutualistic anti-inflammatory activities that help to maintain barrier function. *Staphylococcus aureus* strains that are potentially harmful, as well as other potential pathogens, are inhibited from colonizing. The skin innate immune system, like other organs, is a composite entity of interacting human and microbial elements and the formation of commensal microbiota is a critical factor in building initial physiological control of skin immunity [11].

- Annaabhilasha (Desire of food), *Bhuktasyaparipaaka* (Easy digestion of food)-Suryanamaskar stretches all of the abdominal organs, increases metabolism and blood circulation, and promotes in the easy digestion of food, allowing a person to materialize their food in a timely manner.
- Srusta vin-mootra-vatatwa (Excretion of feces urine and flatus)-Suryanamaskar practices bring about hormonal equilibrium, which leads to overall well health. Every posture counteracts the one before it, resulting in a balance of flexions and extensions. It stimulates practically all of the endocrine system's glands. The pancreas, adrenals, thyroid, pituitary, and other glands start to secrete their hormones normally as a result of this internal stimulation. It also treats pancreas and liver issues, as well as constipation, wind, indigestion, acidity, and intestinal disorders.
- Shareerasylaghavam (Lightness of body)-Suryanamaskar is a deeply spiritual activity that encourages a greater awareness of our bodies' connectivity. In order to prepare, the mind generates a condition of concentration and calmness.
- Suprasnnendriyatwa (Perspicuity of Indriyas)-Suryanamaskar, when paired with proper breathing and bija mantras, energizes the overall mind and intellect. The energy is created by the vibration of the bija mantra. Mantras for gaining mental stability and self-control, or for releasing tensions brought on by modern life. Movements should be coordinated so that they make a single, seamless motion. It gives spiritual power and is effulgent like the sun in removing misery. It also elaborates the intellect and imparts wisdom, as well as resonating in the heart.
- Sukha-swapna prabodanam (Comfortable sleep and awakening)-Many kinds of yoga include mindfulness as a component. It can help individuals sleep better at night by increasing melatonin levels. Deep breathing is a sleep-inducing relaxing method.

Discussion on skin microbiome

Our environment and behaviour have a big impact on our skin microbiome. Skin habitat biodiversity is greatly affected by the biodiversity of the ecosystems in which we live. *Firmicutes*, *Bacteroidetes*, *Proteobacteria*, and *Actinobacteria* are the four phyla of bacteria that live on the skin. Sebaceous areas (where *Propionibacteria* and *Staphylococci* species predominant), wet areas (where *Corynebacteria* species dominant, with *Staphylococci* also present) and dry areas (where mixed populations and a higher prevalence of *Proteobacteria* and *Flavobacteriale* predominate). *Staphylococcus epidermidis*, a member of the *Firmicutes*, responsible for more than 90% of the aerobic resident microbiota.

Conclusion

Changes in microbial diversity generated by Suryanamaskar can help with tissue metabolism, cardio-respiratory fitness, and insulin resistance. The increased population frequency of *Bacteroides*, *Flavobacterium*, and *Parabacteroides* genera was linked to metabolic alterations induced by Suryanamaskar. Suryanamaskar practice is performing twelve postures in a row with forward and reverse bending, as well as deep exhale and inhalation, to the utmost extent feasible. Knowledge of microbiological concepts, particularly microbiota, among the general population is likely to influence societal decisions since it can direct decision-makers. As a result, human health has been considered as the result of the microbiome's complicated relationship with its human host.

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