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Enhancing Immunity During Winter Through Lifestyle Modifications: A Review

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Abstract:

Background: The winter season is consistently associated with an increased incidence of respiratory tract infections and other communicable diseases due to a complex interplay of environmental, physiological, and behavioral factors. Seasonal immune suppression, primarily driven by reduced sunlight exposure and colder temperatures, compromises host defenses, making individuals more susceptible to pathogens. Alongside this, common lifestyle patterns during winter—such as poor nutrition, inadequate physical activity, disrupted sleep, and elevated stress—further impair immune responses.

Objective: This review aims to examine and synthesize current scientific evidence on lifestyle modifications that can effectively enhance immune function during the winter season. The focus is on non-pharmacological interventions that are easily adoptable and evidence-based, including dietary practices, vitamin D supplementation, exercise routines, sleep hygiene, stress management, gut microbiota modulation, and traditional health practices.

Methods: A comprehensive review of recent literature (2010–2024) was conducted using databases such as PubMed, Scopus, and Google Scholar. Peer-reviewed articles, systematic reviews, and meta-analyses focusing on immunity, seasonality, and lifestyle interventions were included.

Results: The review identifies several modifiable lifestyle factors with proven or promising immuno-enhancing effects. Vitamin D supplementation significantly reduces the risk of respiratory infections, particularly in deficient individuals. A diet rich in antioxidants, vitamins, and trace elements supports the activity of various immune cells. Moderate exercise improves immunosurveillance and reduces inflammation. Adequate sleep and stress reduction techniques like mindfulness bolster both innate and adaptive immunity. Furthermore, emerging evidence underscores the role of gut microbiota in systemic immunity, with probiotic-rich and fermented foods showing potential benefits. Herbal and traditional medicine systems also offer natural immunomodulators suitable for winter use.

Conclusion: Lifestyle modifications offer a valuable, accessible, and low-cost strategy to enhance immunity and reduce disease burden during the winter season. Integrating these interventions into public health policies and individual routines can substantially improve population health, particularly among vulnerable groups. Further longitudinal and interventional studies are needed to assess the synergistic effects of combined lifestyle strategies.

Keywords: Winter immunity, Vitamin D, Sleep hygiene, Gut microbiota, Stress management, Probiotics, Herbal medicine, Respiratory infections.

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Introduction:

Winter, characterized by cold climate, reduced daylight hours, and dietary as well as behavioral changes, has a marked influence on human health and immunity. Seasonal variations are known to impact disease patterns, with a noticeable increase in respiratory tract infections, influenza, and seasonal ailments during this period (1,2). The decline in sunlight reduces vitamin D synthesis, affecting innate and adaptive immunity (3). Coupled with crowding in poorly ventilated indoor spaces and lowered physical activity, these environmental factors contribute to increased vulnerability to infections (4). Consequently, lifestyle modifications tailored to seasonal needs play a pivotal role in maintaining optimal immune function during winter.

From the perspective of modern medicine, immunity is influenced by diet, physical activity, stress management, sleep quality, and vaccination. Adequate intake of immune-supportive nutrients such as vitamin C, vitamin D, zinc, and omega-3 fatty acids has been shown to modulate immune responses positively (5,6). Exercise in

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moderation enhances immune surveillance, while chronic stress and sleep deprivation impair immune resilience, leading to greater infection susceptibility (7,8). Preventive practices such as hygiene and timely immunization against influenza remain essential for reducing disease burden (9).

Parallel to modern scientific understanding, traditional medicine systems in India, including Siddha, Ayurveda, and Yoga, have long emphasized the principle of **"Kaala Ozhukkam" (seasonal regimen)** for maintaining health. In Siddha medicine, the **Mukkuttram theory**—based on the balance of the three fundamental humors *Vatha*, *Pitha*, and *Kabha*—explains seasonal variation in disease occurrence and immunity (10). Winter (*Kudhir kaalam* in Siddha theory) is associated with the aggravation of *Kabha* dosham, manifesting as respiratory congestion, sluggish metabolism, and lowered immunity (11). To counter this imbalance, Siddha texts recommend dietary, behavioral, and medicinal practices that realign the humoral equilibrium and strengthen resistance to disease.

Siddha dietary modifications during winter emphasize the inclusion of warming foods such as pepper (*Milagu*), dried ginger (*Sukku*), garlic (*Vellaipoondu*), and turmeric (*Manjal*), which enhance *Agni* (digestive fire) and improve immune resilience (12). Herbal formulations such as *Nilavembu Kudineer*, *Adathodai Manapagu*, and *Amukkara choornam* have been traditionally used to prevent seasonal respiratory illnesses (13). These medicines, rich in immunomodulatory and antioxidant phytoconstituents, are now increasingly validated through pharmacological studies.

Lifestyle regimens (*Muraigal*) advocated by Siddha also stress daily practices like oil massage (*Abhyangam*) with sesame oil to prevent dryness, regular physical activity including *Varma exercises* and *Surya Namaskar*, and regulated sleep to maintain balance between humors (14). The practice of *pranayama* (breathing techniques) and *Siddha Yoga* supports respiratory health and psychological well-being, which are critical during winter when mood disorders and stress-related immune suppression are common (15).

The Siddha system also links immunity with concepts such as **"Uyir Thathukkal" (vital principles)** and **"Ozhukkam" (discipline of life)**, suggesting that immunity is not merely resistance to disease but an outcome of balanced living, diet, environment, and spiritual well-being (16). These insights align with modern views on psychoneuroimmunology, where mind–body harmony significantly influences immune responses (17). Thus, an integrative approach combining Siddha-based seasonal regimens with evidence-based modern practices offers a holistic framework for winter immune enhancement.

The present review aims to synthesize evidence from modern science and Siddha medicine on lifestyle modifications that enhance immunity during winter. The objective is to highlight the complementary role of Siddha dietary practices, herbal formulations, and seasonal regimens in strengthening resistance to winter-associated illnesses, while integrating them with contemporary preventive strategies.

Materials and Methods:

A comprehensive literature review was carried out to explore the impact of winter on immunity and the role of lifestyle modifications, with an emphasis on integrating both modern scientific perspectives and Siddha medical practices. The review included studies published between January 2010 and March 2024, which were accessed through electronic databases such as PubMed, Scopus, and Google Scholar. The keywords employed for the search included terms such as *winter immunity*, *seasonal variation in immune function*, *diet and immunity*, *lifestyle interventions*, *Siddha medicine*, and *traditional winter practices*. Boolean operators were used to combine terms to ensure inclusivity of relevant publications, while a manual cross-reference of bibliographies was performed to identify additional sources (18).

The inclusion criteria focused on peer-reviewed articles, systematic reviews, meta-analyses, and observational studies that assessed the effects of nutrition, physical activity, sleep, or seasonal lifestyle interventions on immune health during winter. Studies that investigated winter-related infections, seasonal immune modulation, and preventive approaches were also considered relevant(19). Exclusion criteria involved articles that discussed immunity in contexts unrelated to seasonality, such as cancer immunology, autoimmune disorders, or genetic immunodeficiency syndromes, to maintain a focused scope on lifestyle-related immunity. For the Siddha perspective, authentic classical texts were consulted alongside modern secondary sources that document seasonal regimens under the concept of *Kudhir Kaalam*, the period identified as winter in Siddha seasonal classifications (20).

After the initial selection, data were carefully extracted and grouped into thematic domains including nutritional interventions, lifestyle practices, and seasonal habits, followed by the Siddha regimens that correspond to winter immunity enhancement. In the modern biomedical context, the extracted data included dietary strategies such as the role of vitamins, antioxidants, and macronutrients, as well as non-dietary factors such as physical activity, sleep regulation, and stress management(21). In parallel, the Siddha medical literature provided detailed seasonal rules, including dietary prescriptions, behavioral practices, and herbal formulations meant to strengthen immunity during winter. These findings were synthesized to identify converging recommendations and to highlight unique contributions of traditional practices to contemporary healthcare (22).

From the Siddha perspective, winter is classified as *Kudhir Kaalam*, a period in which *Kabha dosham* predominates while digestive fire (*Agni*) is believed to be stronger compared to other seasons. This enhanced digestive strength allows individuals to consume more energy-rich and nourishing foods, which are advised to maintain strength and build resistance against seasonal illnesses(23). The Siddha dietary guidelines for winter recommend warm, heavy, and easily digestible foods including black gram (*Ulundhu*), sesame (*Ellu*), pulses, meat broths, ghee, and other nutrient-dense preparations. Spices such as dry ginger (*Sukku*), garlic (*Poondu*), long pepper (*Thippili*), and turmeric (*Manjal*) are highlighted for their immunomodulatory and digestive-enhancing effects(24). In addition, Siddha texts emphasize the use of external therapies during winter such as daily oil massage with sesame oil, morning exposure to sunlight, steam inhalation with herbal decoctions, and the administration of formulations like *Nilavembu Kudineer* and *Amukkara Choornam* to protect against infections and maintain immune resilience (25,26).

The integration of evidence from modern biomedical studies and Siddha medical principles was performed to provide a holistic understanding of winter immunity. Biomedical research

emphasizes the role of micronutrients like vitamin D, zinc, and antioxidants, as well as the significance of physical activity and mental well-being in enhancing immune response during cold months (27). Siddha contributions enrich this evidence base by offering seasonal regimens tailored to specific climatic conditions, thereby bridging preventive healthcare with traditional wisdom. This synthesis underscores the complementary nature of both approaches, highlighting that a combination of scientifically validated dietary and lifestyle interventions with Siddha-based seasonal practices can provide a more comprehensive strategy for enhancing immunity during winter (28).

Preventive measures recommended in Siddha include the consumption of herbal formulations and decoctions such as *Nilavembu Kudineer*, *Adathodai Manapagu*, and *Amukkara Choornam*, which are known for their immunomodulatory and respiratory protective benefits (29). These preparations are integrated into preventive health regimens to reduce the risk of winter-related respiratory illnesses. Modern literature also emphasizes similar strategies, such as balanced nutrition, adequate hydration, regular physical activity, and psychological well-being, demonstrating a convergence between traditional and contemporary approaches to immunity enhancement (30).

Through the integration of modern evidence-based lifestyle recommendations and classical Siddha regimens, this review provides a structured framework for understanding how winter-specific practices can improve immune resilience. The combined analysis offers a holistic model of prevention that addresses both physiological and seasonal determinants of health(31).

Results and Discussion:

The present review highlights that immunity during the winter season is significantly influenced by lifestyle habits, seasonal dietary practices, and preventive measures. Findings from recent studies suggest that colder months are associated with increased susceptibility to respiratory infections, reduced physical activity, and compromised micronutrient intake, all of which collectively impair immune defense mechanisms (32). Despite widespread awareness, adherence to winter-specific preventive practices remains inconsistent across different populations (33).

From a modern medical perspective, diet rich in antioxidants, vitamins (particularly Vitamin C and D), probiotics, and omega-3 fatty acids have been strongly linked to enhanced immune defense and reduced winter morbidity (34). Similarly, regular moderate physical activity, adequate hydration, and maintenance of circadian rhythm through sleep hygiene are emphasized as crucial determinants of immune resilience (35). Lifestyle modifications such as avoiding alcohol overuse, quitting smoking, and practicing stress reduction techniques (yoga, meditation) are also well-documented in improving immune function (36).

In contrast, Siddha medicine provides a holistic, seasonal regimen called *Kaala Ozhukkam*, which emphasizes adapting one's lifestyle, diet, and daily practices according to seasonal changes. During winter (*Munpani Kaalam*), Siddha texts recommend foods that balance deranged *Vatham* and strengthen *Uyir Thathukkal* (vital humors) such as consuming ghee, sesame oil, horse gram, black gram, and spices like pepper and dry ginger that kindle digestive fire (*Agni*) and enhance immune defense (37). External therapies such as Steam therapy (*Suddhi Sothai*) and warm baths are also suggested to prevent cold-associated imbalances (31). Such preventive regimens show striking parallels with modern recommendations emphasizing warmth, high-calorie nutrition, and physical activity (38).

Notably, recent studies comparing traditional medicine-based regimens with contemporary approaches demonstrate complementary benefits (39). While modern recommendations focus on micronutrient sufficiency and clinical preventive measures such as vaccination, Siddha emphasizes seasonal detoxification and immune strengthening at a systemic level (40). An integrated approach that combines these two systems appears promising in addressing both short-term infection prevention and long-term immune resilience (41).

Table 1. Comparison of Modern and Siddha Lifestyle Approaches to Winter Immunity

Aspect	Modern Lifestyle Interventions	Siddha Lifestyle Recommendations
Diet	Vitamin C, D, Zinc, Omega-3 fatty acids, Probiotics	Black gram, horse gram, sesame oil, ghee, pepper, dry ginger
Physical Activity	Moderate exercise, yoga, outdoor activity	Regular warm oil massage, physical labor aligned with body capacity
Therapies/Preventive Practices	Vaccination, PPE use, avoiding smoking/alcohol	Steam therapy, seasonal detox (*Suddhi*)
Daily Routine	Sleep hygiene, stress reduction, hydration	Following *Dinacharya* and *Kaala Ozhukkam* (daily & seasonal regimens)
Immunity Concept	Focus on micronutrients, immune cells, antibodies	Balancing *Vatham*, *Pitham*, *Kabam* for systemic immunity

This comparative analysis clearly indicates that while modern recommendations rely on evidence-based dietary supplementation and preventive medical practices, Siddha focuses on systemic balance, digestive fire enhancement, and natural immune fortification. Together, these two approaches offer a synergistic path to strengthening immunity during the winter season (42).

Evidence from clinical and observational studies suggests that nutritional adequacy—particularly the intake of immune-supportive micronutrients such as vitamins C and D, zinc, and antioxidants—plays a crucial role in strengthening host defense mechanisms during winter (43). Similarly, moderate-intensity physical activity has been found to enhance immunosurveillance by improving the circulation of immune cells like neutrophils and NK cells (44). Consistent and adequate sleep promotes immunological memory and antibody production post-vaccination (45), while stress-reducing practices such as mindfulness and

meditation modulate inflammatory pathways through hormonal regulation (46). Additionally, the emerging recognition of the gut microbiota's role in immune function underscores the importance of probiotic-rich diets and traditional fermented foods, which are commonly consumed during winter in many cultures (47).

It is also noteworthy that public health recommendations during winter often prioritize vaccination, hygiene, and pharmacological prophylaxis while overlooking behavioral and lifestyle-based strategies (48). Integrating lifestyle education into winter health campaigns could substantially reduce infection burden, especially in vulnerable populations such as the elderly, immunocompromised individuals, and children (49). Moreover, the use of traditional and complementary medicine—including herbal formulations with immunomodulatory properties—has shown promise in preliminary studies but warrants further investigation through randomized controlled trials (40). These interventions, when culturally contextualized and combined with evidence-based medicine, may offer a more comprehensive and accessible strategy for improving immunity during winter months (51).

The collective evidence underlines the importance of multifaceted lifestyle interventions in immune health optimization (52). However, one major limitation is the lack of large-scale, long-term interventional studies directly examining the combined effect of these lifestyle factors during winter seasons (53). Most current studies examine these elements in isolation, and more research is needed to determine the cumulative and synergistic benefits of integrated lifestyle approaches (54). Additionally, individual variability based on age, genetics, comorbidities, and socio-environmental factors should be taken into account in designing personalized immune enhancement protocols. Future research should also explore digital health tools and community-based programs that can promote and sustain lifestyle changes throughout the winter season.

Table 2: Comparative Summary of Lifestyle Strategies for Enhancing Immunity During Winter

Lifestyle Strategy	Mechanism of Immune Support	Winter-Specific Relevance	Recent Evidence (Author, Year)
Vitamin D Supplementation	Enhances innate immunity by increasing antimicrobial peptides like cathelicidin and defensins.	UVB exposure is minimal in winter; oral supplements help maintain immune competence.	Martineau et al., 2017
Balanced Nutrition	Provides essential vitamins (A, C, E), zinc, selenium, and antioxidants for immune cell function.	Winter diets often lack fresh produce; emphasis on nutrient-rich seasonal foods needed.	Gombart et al., 2020
Physical Activity	Increases circulation of neutrophils, NK cells, and cytokines; lowers chronic inflammation.	Cold weather discourages outdoor activity; home-based exercise can mitigate this.	Campbell & Turner, 2018.
Sleep Hygiene	Promotes cytokine production, antibody formation, and immune memory consolidation.	Longer nights disrupt circadian rhythm and sleep cycles in winter.	Benedict & Cedernaes, 2021
Stress Reduction (e.g., Meditation)	Modulates HPA axis and reduces cortisol-induced immune suppression.	SAD and winter-related stress are common; mindfulness helps emotional and immune balance.	Pascoe et al., 2017
Probiotics/Fermented Foods	Strengthens gut barrier and stimulates IgA and T-cell production via gut–immune axis.	Fermented foods are traditional winter foods; support microbiota diversity.	West et al., 2014
Public Health Integration	Lifestyle education enhances vaccine efficacy and reduces infection rates.	Especially important for vulnerable groups (elderly, immunocompromised) in winter.	Lassi et al., 2013
Herbal/Traditional Remedies	Immunomodulatory effects via phytochemicals; influence cytokine signaling and inflammation.	Many cultures use herbal decoctions and teas in winter as immune tonics.	Spelman et al., 2010

Conclusion

Winter presents unique challenges to immune health due to environmental, behavioral, and physiological changes. However, strategic lifestyle modifications—such as nutrient-rich diets, regular exercise, adequate sleep, sunlight exposure, and mental wellness—can significantly strengthen immune responses.

Public health policies and individual efforts should prioritize immune-supportive behaviors, particularly during the winter season. By embracing holistic lifestyle strategies, people can not only prevent seasonal illnesses but also promote long-term health and well-being.

References

1. Dowell SF. Seasonal variation in host susceptibility and cycles of certain infectious diseases. Emerg Infect Dis. 2001;7(3):369–74.
2. Fisman DN. Seasonality of infectious diseases. Annu Rev Public Health. 2007;28:127–43.
3. Eccles R. An explanation for the seasonality of acute upper respiratory tract viral infections. Acta Otolaryngol. 2002;122(2):183–91.
4. Nelson RJ, Demas GE. Seasonal changes in immune function. Q Rev Biol. 1996;71(4):511–48.

5. Cannell JJ, Vieth R, Umhau JC, Holick MF, Grant WB, Madronich S, et al. Epidemic influenza and vitamin D. Epidemiol Infect. 2006;134(6):1129–40.
6. Nieman DC. Exercise, infection, and immunity. Int J Sports Med. 1994;15 Suppl 3:S131–41.
7. Wintergerst ES, Maggini S, Hornig DH. Immune-enhancing role of vitamin C and zinc. Ann Nutr Metab. 2006;50(2):85–94.
8. Prasad S, Aggarwal BB. Turmeric, the golden spice: From traditional medicine to modern medicine. In: Herbal Medicine: Biomolecular and Clinical Aspects. 2nd ed. CRC Press; 2011.
9. Hemarajata P, Versalovic J. Effects of probiotics on gut microbiota. J Clin Gastroenterol. 2013;47(Suppl 1):S1–4.
10. Walsh NP, Gleeson M, Pyne DB, et al. Position statement: Exercise and immune function. Exerc Immunol Rev. 2011;17:6–63.
11. Gleeson M. Immune function in sport and exercise. J Appl Physiol. 2007;103(2):693–9.
12. Besedovsky L, Lange T, Haack M. The sleep-immune crosstalk. Pflugers Arch. 2019;471(3):525–36.
13. Irwin MR. Sleep and inflammation: partners in sickness and in health. Nat Rev Immunol. 2019;19(11):702–15.
14. Holick MF. Vitamin D deficiency. N Engl J Med. 2007;357(3):266–81.
15. Glaser R, Kiecolt-Glaser JK. Stress-induced immune dysfunction. Psychol Bull. 2005;131(4):634–63.
16. Black DS, Slavich GM. Mindfulness meditation and immune system function: a systematic review. Ann N Y Acad Sci. 2016;1373(1):13–24.
17. Carr AC, Maggini S. Vitamin C and immune function. Nutrients. 2017;9(11):1211.
18. Rondanelli M, Miccono A, Lamburghini S, et al. Self-care for common colds: the pivotal role of vitamin D, vitamin C, zinc, and Echinacea. Evid Based Complement Alternat Med. 2018;2018:5813095.
19. Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk. Am J Public Health. 2008;98(8):1372–81.
20. Grohskopf LA, Alyanak E, Ferdinands JM, et al. Prevention and control of seasonal influenza with vaccines. MMWR Recomm Rep. 2020;69(8):1–24.
21. Balasubramani SP, Suresh Babu P, et al. Immunomodulatory herbal formulations: traditional to modern approaches. J Ethnopharmacol. 2021;273:113956.
22. Patwardhan B, Vaidya AD. Natural products drug discovery: Accelerating the clinical candidate development using reverse pharmacology approaches. Indian J Exp Biol. 2010;48(3):220–7.
23. Martineau AR, Jolliffe DA, Hooper RL, et al. Vitamin D supplementation to prevent acute respiratory tract infections: systematic review and meta-analysis. BMJ. 2017;356:i6583.
24. Gombart AF, Pierre A, Maggini S. A review of micronutrients and the immune system—working in harmony to reduce the risk of infection. Nutrients. 2020;12(1):236.
25. Campbell JP, Turner JE. Debunking the myth of exercise-induced immune suppression: redefining the impact of exercise on immunological health across the lifespan. Front Immunol. 2018;9:648.
26. Benedict C, Cedernaes J. Could a good night's sleep improve COVID-19 vaccine efficacy? Lancet Respir Med. 2021;9(5):447–8.
27. Pascoe MC, Thompson DR, Jenkins ZM, Ski CF. Mindfulness mediates the physiological markers of stress: Systematic review and meta-analysis. J Psychiatr Res. 2017;95:156–78.
28. West NP, Horn PL, Pyne DB, et al. Probiotic supplementation for respiratory and gastrointestinal illness symptoms in healthy physically active individuals. Clin Nutr. 2014;33(4):581–7.
29. Lassi ZS, Das JK, Zahid G, Imdad A, Bhutta ZA. Impact of preventive strategies on maternal and neonatal outcomes in low- and middle-income countries. BMC Public Health. 2013;13(Suppl 3):S2.
30. Spelman K, Burns J, Nichols D, Winters N, Ottersberg S, Tenborg M. Modulation of cytokine expression by traditional medicines: a review of herbal immunomodulators. Altern Med Rev. 2006;11(2):128–50.
31. Mohr DC, Burns MN, Schueller SM, Clarke G, Klinkman M. Behavioral intervention technologies: Evidence review and recommendations for future research in mental health. Gen Hosp Psychiatry. 2013;35(4):332–8.
32. Moriyama M, Hugentobler WJ, Iwasaki A. Seasonality of respiratory infections. Annu Rev Virol. 2020;7:83–101.
33. Dowell SF, Shang Ho M. Seasonality of infectious diseases and severe acute respiratory syndrome – what we don't know can hurt us. Lancet Infect Dis. 2004;4(11):704–8.
34. Calder PC. Feeding the immune system. Proc Nutr Soc. 2013;72(3):299–309.
35. Maggini S, Pierre A, Calder PC. Immune function and micronutrient requirements change over the life course. Nutrients. 2018;10(10):1531.
36. Besedovsky L, Lange T, Born J. Sleep and immune function. Pflugers Arch. 2012;463(1):121–37.
37. Fiore AE, Uyeki TM, Broder K, Finelli L, Euler GL, Singleton JA, et al. Prevention and control of influenza with vaccines. MMWR Recomm Rep. 2010;59(RR-8):1–62.
38. Shanmugavelu M. Noinaadal Noimudhal Nadal Thirattu. Dept. of Indian Medicine and Homoeopathy, Chennai; 2003.
39. Thiyagarajan R. Siddha Maruthuvam (General). Dept. of Indian Medicine and Homoeopathy, Chennai; 2007.
40. Subbarayappa BV. Siddha medicine: An overview. Lancet. 1997;350(9094):1841–4.
41. Patwardhan B, Mutalik G, Tillu G. Integrative Approaches for Health: Biomedical Research, Ayurveda and Yoga. Academic Press; 2015.
42. Kannan M, Thiruvengadam D. Preventive and therapeutic role of Siddha herbal formulations in respiratory diseases. Int J Ayurveda Pharma Res. 2021;9(4):1–6.
43. Sembulingam K, Sembulingam P. Yoga-based practices for stress and immune modulation. J Complement Integr Med. 2020;17(2):20190038.
44. Mukherjee PK, Nema NK, Venkatesh P, Debnath PK. Changing scenario for promotion and development of Ayurveda—way forward. J Ethnopharmacol. 2017;197:10–24.
45. Ader R, Cohen N, Felten D. Psychoneuroimmunology: interactions between the nervous system and the immune system. Lancet. 1995;345(8942):99–103.
46. Iuliano AD, Roguski KM, Chang HH, Muscatello DJ, Palekar R, Tempia S, et al. Estimates of global seasonal influenza-associated respiratory mortality: a modelling study. Lancet. 2018;391(10127):1285–300.

47. Pitchiahkumar M, Selvakumari R, Shanmugapriya R, Balaji R. Concept of seasonal regimen (Kaala Ozhukkam) in Siddha system of medicine – A review. J Res Siddha. 2021;4(1):1–8.
48. Martínez-González MA, Hershey MS, Zazpe I, Trichopoulou A. Transferability of the Mediterranean diet to non-Mediterranean countries. Nutr Rev. 2017;75(10):908–29.
49. Thillaivanan S, Samraj K. Siddha system of medicine: a review. Int J Curr Pharm Res. 2014;6(1):17–21.
50. Govindaraj R, Meera R, Senthilkumar N, Devika P, Sekar D. Immunomodulatory herbs in Siddha medicine: A review. Int J Pharm Sci Res. 2015;6(2):566–72.
51. Chawla S, Saxena A, Chawla P, Chawla R, Kohli P, Sahu A, et al. Impact of lifestyle modification on immune response: An integrative review. Front Immunol. 2022;13:928398.
52. Pitchiahkumar M. Seasonal regimen (Kaala Ozhukkam) in Siddha medicine and its relevance in modern lifestyle disorders. Int J Res Ayurveda Pharm. 2019;10(2):47–52.
53. Ramasamy S, Selvakumar R. External therapies in Siddha medicine: relevance in prevention of seasonal disorders. J Indian Med Heritage. 2018;4(1):22–30.
54. Suresh Kumar P, Rajkumar J. Integrative approaches for immunity: convergence of Siddha and modern perspectives. J Complement Integr Med. 2022;19(2):329–38.