

ISSN-P : 2616-955X | ISSN-E : 2663-7030

DOI(Journal): 10.31703/grr

DOI(Volume): 10.31703/grr/.2024(IX)

DOI(Issue): 10.31703/grr.2024(IX.II)



GRR

GLOBAL REGIONAL REVIEW

VOL. IX, ISSUE II, SPRING (JUNE-2024)



Double-blind Peer-review Research Journal

www.grrjournal.com

© Global Regional Review

Article title

Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan

Global Regional Review

p-ISSN: 2616-955X e-ISSN: 2663-7030

DOI(journal): 10.31703/grr

Volume: IX (2024)

DOI (volume): 10.31703/grr.2024(IX)

Issue: II Spring (June-2024)

DOI(Issue): 10.31703/grr.2024(IX-II)

Home Page

www.grrjournal.com

Volume: IX (2024)

<https://www.grrjournal.com/Current-issues>

Issue: II-Spring (June-2024)

<https://www.grrjournal.com/Current-issues/9/2/2024>

Scope

<https://www.grrjournal.com/about-us/scope>

Submission

<https://humaglobe.com/index.php/grr/submissions>

Google Scholar



Visit Us



Abstract

Medicinal plants are used by many traditional herbal healers to cure many diseases. This study examines local response towards the environmental change, focusing on how the traditional community of Jalalabad, Gilgit understands this change. It examines the perception of people and the use of medicinal herbs produced in the adjacent areas of Jalalabad. Explanatory and qualitative research designs along with semi-structured interviews were administered for data collection. A sample of 20 elderly grandmothers was selected. The findings suggest that several herbs were still in practice to solve the skin, digestive, respiratory, and skin-related problems in the selected community. Due to climate change, many problems emerged over time but still, respondents wanted to continue the use of herbs because of no side effects. The study also recommended that scientific intervention, training, and preservation of traditional knowledge are needed to preserve the indigenous culture and practices of the far northern people.

Key Words: Indigenous Knowledge, Herbs, Climate Change

Authors:

Nida Batool: (Corresponding Author)

MPhil Scholar, Faculty of Social Sciences,
Department of Anthropology, Arid Agriculture
University, Rawalpindi, Punjab, Pakistan.
(Email: nidamurtaza2020@gmail.com)

Nazia Rafiq: Assistant Professor, Department of Anthropology,
Pir Mehr Ali Shah Arid Agriculture University -
PMAS AAUR, Rawalpindi, Punjab Pakistan.

Pages: 149-156

DOI: 10.31703/grr.2024(IX-II).16

DOI link: [https://dx.doi.org/10.31703/grr.2024\(IX-II\).16](https://dx.doi.org/10.31703/grr.2024(IX-II).16)

Article link: <http://www.grrjournal.com/article/A-b-c>

Full-text Link: <https://grrjournal.com/fulltext/>

Pdf link: <https://www.grrjournal.com/jadmin/Auther/31rv1olA2.pdf>

Citing Article

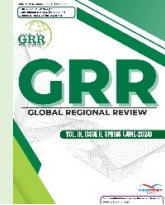
16	Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan						
	Author	Nida Batool Nazia Rafiq		DOI	10.31703/grr.2024(IX-II).16		
Pages	149-156	Year	2024	Volume	IX	Issue	II
Referencing & Citing Styles	APA	Batool, N., & Rafiq, N. (2024). Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan. <i>Global Regional Review</i> , IX(II), 149-156. https://doi.org/10.31703/grr.2024(IX-I).16					
	CHICAGO	Batool, Nida, and Nazia Rafiq. 2024. "Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan." <i>Global Regional Review</i> IX (II):149-156. doi: 10.31703/grr.2024(IX-I).16.					
	HARVARD	BATOOL, N. & RAFIQ, N. 2024. Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan. <i>Global Regional Review</i> , IX, 149-156.					
	MHRA	Batool, Nida, and Nazia Rafiq. 2024. 'Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan', <i>Global Regional Review</i> , IX: 149-56.					
	MLA	Batool, Nida, and Nazia Rafiq. "Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan." <i>Global Regional Review</i> IX.II (2024): 149-56. Print.					
	OXFORD	Batool, Nida and Rafiq, Nazia (2024), 'Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan', <i>Global Regional Review</i> , IX (II), 149-56.					
	TURABIAN	Batool, Nida and Nazia Rafiq. "Ingenious Medicinal Herb Practices: Impact of Climate Change on Production and Utilization in Jalalabad Gilgit, Gilgit Baltistan." <i>Global Regional Review</i> IX, no. II (2024): 149-56. https://dx.doi.org/10.31703/grr.2024(IX-I).16 .					



Global Regional Review

www.grrjournal.com

DOI: <http://dx.doi.org/10.31703/grr>



Pages: 149-156

URL: [https://doi.org/10.31703/grr.2024\(IX-II\).16](https://doi.org/10.31703/grr.2024(IX-II).16)

Doi: 10.31703/grr.2024(IX-II).16



Cite Us



Title

**Ingenious Medicinal Herb Practices:
Impact of Climate Change on
Production and Utilization in
Jalalabad Gilgit, Gilgit Baltistan**

Authors:

Nida Batool: (Corresponding Author)

MPhil Scholar, Faculty of Social Sciences, Department of Anthropology, Arid Agriculture University, Rawalpindi, Punjab, Pakistan.

(Email: nidamurtaza2020@gmail.com)

Nazia Rafiq: Assistant Professor, Department of Anthropology, Pir Mehr Ali Shah Arid Agriculture University - PMAS AAUR, Rawalpindi, Punjab Pakistan.

Contents

- [Introduction](#)
- [Objectives](#)
- [Review of literature](#)
- [Material and Methods](#)
- [Data and Discussion](#)
- [General Hygienic Condition](#)
- [Knowledge](#)
- [Destruction of Biodiversity](#)
- [Conclusion](#)
- [References](#)

Abstract

Medicinal plants are used by many traditional herbal healers to cure many diseases. This study examines local response towards the environmental change, focusing on how the traditional community of Jalalabad, Gilgit understands this change. It examines the perception of people and the use of medicinal herbs produced in the adjacent areas of Jalalabad. Explanatory and qualitative research designs along with semi-structured interviews were administered for data collection. A sample of 20 elderly grandmothers was selected. The findings suggest that several herbs were still in practice to solve the skin, digestive, respiratory, and skin-related problems in the selected community. Due to climate change, many problems emerged over time but still, respondents wanted to continue the use of herbs because of no side effects. The study also recommended that scientific intervention, training, and preservation of traditional knowledge are needed to preserve the indigenous culture and practices of the far northern people.

Keywords: [Indigenous Knowledge](#), [Herbs](#), [Climate Change](#)

Introduction

One area most susceptible to climate change is Gilgit Baltistan. Generally, climate change and change in temperatures and weather are used interchangeably. Even though climate change may

be natural, multiple human actions have been its primary cause such as air pollution, industries, and many other technologies that produce heat-trapping gases. At this point, the evidence for fast climate change appears to be overwhelming. The average



worldwide temperatures are predicted to rise by up to 4 °C by 2100, affecting precipitation patterns in the process. Identifying the consequences on biodiversity and how they might be prevented is a Fundamental Issue in ecology (Thuiller & W, 2007).

The Republic of Africa announced a nationwide policy to reduce climatic issues that create a hazardous environment for the socio-economic status of people through various planned and recognizable possibilities. The same issue was also diagnosed by the National Department of Environmental Affairs in 2013 (Ziervogel & Midgley, 2014). Climate change leading to the loss of biodiversity in the regions. Rising temperatures are causing changes in the timing of flowering and fruiting of plants which can disturb the food chain. The possibility exists now that artificial climate change will persist for many centuries. We are entering uncharted territory about climate, and the results could be pretty distressing (Karl & Trenberth, 2023).

Agriculture is the primary livelihood source for the people of Gilgit Baltistan. Climate change is causing changes in temperature and rainfall patterns, leading to reduced crop yields and affecting food security in the region. Water scarcity is already a significant issue in Gilgit Baltistan, and climate change is exacerbating the problem. Glacier meltwater is an essential source of freshwater in the region, and the loss of glaciers is reducing the availability of these resources. Climate change significantly impacts the environment and people of Gilgit Baltistan; urgent action is needed to mitigate these impacts and build resistance and the region. On the planet, every person is affected by climate change. Natural disasters cut children, and people, off from nutritious food and safe water. Due to this, our environment will destroy safe shelter, Health, and food. Greenhouse gas emissions, deforestation, and other hazardous practices harm our environment.

The UN Framework Convention on Climate Change (UNFCCC) is the first international agreement that addresses the issues of climate change initiated in 1992 at the Earth Summit in which 197 countries ratified the convention. The major aim was to stop the human harmful interventions in the climatic system. Pakistan has had devastating floods, droughts, and tornadoes in recent years. The likelihood that these and other

natural disasters will occur more frequently and be more severe in the decades to come is increased by climate change, which serves as a sharp reminder that Pakistan is one of the nation's most vulnerable to its consequences.

Health-seeking behavior is defined as how "Any activity undergone by any individual who requires a remedy for any ailment or illness". It's also referred to as unhealthy behavior or ill behavior. Health-seeking behavior is part of a wider concept called health behavior, which focuses on behaviors that help people stay healthy. It prevents and as well as manages good health (WHO, 2020). There are two types of characteristics that have a major impact on health-seeking behavior during sickness. The modification of the formal system of care related to people's conduct falls under the first category. The research that pinpoints the process of sickness response or health-seeking behavior makes up the second group. According to research, a person's decision about a medical system is influenced by a number of factors, including socioeconomic status, gender, age, social position, ailment, and quality of service.

Objectives

Two particular objectives have been formulated to document the

1. Cultural knowledge and practices associated with the daily use of herbs and
2. To explore the climatic impacts on the production and conservation of medicinal plants.

Review of literature

Regional communities always developed solutions based on their knowledge, competency, and cognitive skills to deal with environmental calamities. Indigenous people may develop strong ties and familiarity with their surroundings, in culturally suitable and beneficial ways for the ecosystem and the community members. Indigenous people are adopting, and using native knowledge, for survival, but climate change adversely affects their health and livelihood. Some scholars stated that indigenous skills and knowledge are advantageous to the survival and well-being of the natives (Krech, 2005; Carpenter et al., 2001; Johannes, 1998; Berkes, 1993). On the other hand, climate has a negative effect on vulnerable

communities in high-risk locations, especially natural resource-dependent communities.

The Kalasha people of Pakistan employ a traditional skill known as 'Suri Jagek', which translates to 'observing the sun,' to predict weather patterns, organize the planting of crops, and raise livestock. In order to retain the neighborhood's sense of community and ability to adjust to shifting weather patterns. Due to community-based adaptation models, the local population's resilience to climate fluctuation and change can be strengthened. Despite the fact that subsistence farmers have regularly employed adaptation tactics to some of these changes over the years, effective adaptation techniques should aim to protect their well-being in the face of climate change (Somah, [2013](#)). Climate is already affecting adversely, and new adaptation methods are crucial, especially for poor countries like Pakistan where the degradation rate is higher (Nhemachena & Hassan, [2007](#)). Adaptation is so important; mitigation techniques may be utilized but will not be sufficient to stop changes in the global climate (Bizikova et al., [2012](#)).

Herbs may be medicinal plants that were part of human communities for centuries, and various cultures promoted herbs for sustainable living in their respective areas. Herbs came from surrounding areas which not only helped to sustain the ecosystem but also the connection with land. Mountains covered almost a quarter of the land surface and hosted 12% of the total population on planet Earth (Korner & Spehn, 2002). In Pakistan, the Karakorum ranges host diverse communities in the extreme north of Pakistan, and provide timber, fuel wood, herbal medicine, and fodder to the inhabitants of Himalaya and Hindu Kush. Harsh or to some extent extreme weather or climatic conditions and remoteness hamper the basic development of services, education, and health (Veith & Shaw, [2011](#)). The health facilities provided by the government to the people were not sufficient enough which is why traditional healing mechanisms were practiced and observed in the selected locality.

Limited literature documented the use of herbal plants and the impact of climate change on their production and utility (Khan, [2007](#); Khan et al., [2011](#)). There is no anthropological study presented which includes the preference and the utility of

medicinal plants and their production for the benefit of the community living in Jalalabad, Gilgit. A number of studies like Shiger Valleys were documented here, the valley is the home of various glaciers, high peaks, hot springs, and various tracks, and most importantly the presence of medicinal herbs. Said ethnobotanical survey was conducted by (Abbas et al, [2017](#)) from July 2013 to October 2016 in 17 sites in the Shiger Valley. A total of 84 medicinal plant species belonging to 72 genera and 36 families were collected which were commonly used by the community.

In Baltistan, it was observed that the folk healers used *Betula utilis* to treat ringworms and also in leprosy in Chapursan and Hunza (Wazir, Dasti & Shah, [2004](#)). Hussain et al. ([2011](#)) in their study stated that in central Karakoram National Park same herbal plant was used for stomach aches and diarrhea. People of Shigar used *Solanum nigrum* for toothache, whereas it was used as a tonic for the liver, a medicine for eye pain, and used in skin treatment in India, lesser and Himalayas (Abbasi, [2010](#)).

It was also evident that people of Swat used *Artemisia scopria* for the abdominal worms' treatment (Hayamun, Afzal & Khan, 2006). Another study reported the same purgative in Gujrat (Hussain et al., [2010](#)), and an effective remedy against hyper-acidic stomach in the Zhejiang province of China (Cha et al., [2006](#)).

Material and Methods

The study was conducted to document the local perception of climate change which **impacts their** traditional knowledge and Practices of herbs in Jalalabad, Gilgit Baltistan. An explanatory method from qualitative research design was adopted for data collection. Particularly, for the data collection, observation for example participant observation, semi-structured interviews, and case studies were conducted to document and explore the herbal practices of the indigenous people as a survival instinct. Overall, 20 interviews have been conducted from Jalalabad particularly aged women (grandmothers ranging from 50 to 75 years old). Elderly grandmothers were interviewed due to their keen interest in herbal use and prior knowledge in this regard. They had the information and form of herbs that may be used for certain health issues

related to skin or internal organs. An observatory checklist was made to measure the daily patterns of herbs and purchases; a semi-structured interview guide was used to enlist the names and utility of the herbs among the selected community.

Data and Discussion

The current study falls in the domain of medical and cultural anthropology. And the goal of the current study was to document ethno-medicine. The study focuses on native perceptions and attitudes towards ethno-medicine and the significance of why community members willingly used herbs against so many health problems. Since Gilgit is an enormous region, Jalalabad Valley was chosen in light of the accessibility advantages, where males and females are working hard to meet their day-to-day chores. The study majorly focused on the perspectives and consumption of herbs and their perception of ethno-medicine.

Socio-demographic information of the respondents, each respondent represents one family so in this manner there were 10 families who lie under the realm of nuclear families, 7 families had a joint family system, whereas 3 families were extended families. No one was literate, formally literate because of age bracket and for them *'education and schooling is the new thing of modernity.'* If I talked about socioeconomic status, 15 respondents belonged to the lower and 5 belonged to the lower-middle class. The narratives and patterns of the current study revealed that respondents had good knowledge and awareness of traditional medicine.

It has been discovered that a considerable number of respondents go to traditional healers for

care. It was observed that respondents had good knowledge and awareness of traditional medicine. Traditional medicine appears to be well-liked not only among elderly individuals but also among youngsters as well. The inclusion of herbal medicine in the contemporary healthcare system not only broadens the scope of the country's healthcare system but also helps patients take control of their own care by giving them a variety of healthcare options.

A list of the medicinal plants (see table no. 1), their name, and utility in the selected community were made after interviews; which were used to treat a wide range of human and animal health problems as well. The majority of the respondents, still rely on medicinal plants for basic illnesses e.g. colds, cough, diarrhea, fevers, skin infections, bone infections, body pain, constipation, blood pressure, sore eyes, and tooth infections.

It was evident that the impact of climate change on traditional communities is always multifaceted. Traditional communities like the people of Jalalabad Valley have a deep connection with their native environment; that is part of their cultural practices and knowledge industry. Climatic change to some extent change in ecosystem and weather patterns, the people of Jalalabad often faced various challenges due to low economic and less mobility issues. Traditional herbs have been used for medicinal, nutritional, and cultural use. Due to changes in climate, the availability and utility may be affected which is further divided into various segments which were discussed in the latter part of the article.

Table 1

List of Herbal Plants used in Jalalabad

Sr.	Name of the Plant	Local Name	Parts Used	Form	Uses
1	Anaphalis nepalensis var. nepelensis (C.B.Clarke) Ridley	Chikee	Flower, Fruits	Fume and Powder	Gastro, Intestinal Elements, Aromatic
2	Taraxacum officinale L.	Ishkanache	Leaves, Roots	Powder and Juice	Diuretic, constipation and Jaundice Joint Pain, Diabetes,
3	Berberis lyceum Royle	Ishkeen	Roots, Fruit	Paste and Powder	bone injuries, (fractures, wounds in livestock and humans)

Sr.	Name of the Plant	Local Name	Parts Used	Form	Uses
4	Carum carvi L.	Hayyo	Seed, Fruits	Powder and Direct use	Ingredient of food and spices, Carminative, appetite stimulant, used as herbal tea
5	Datura stramonium Linn	Datura	Flower, Fruit seeds, Leave	Juice, Powder, paste	Earache, dandruff and hair loss, toothache, antispasmodic and narcotic and bolis, and sores
6	Elaeagnus angustifolia L.	Ghandair	Flowers, Fruits, and Gum	Direct	Mental Relaxation, Fragrant, sour throat, cough, cold, fevers and asthma, satisfaction and happiness.
7	Hippophea rhamnodie L.	Buru	Fruits	Juice, Paste, Powder and Direct	Cosmetics, Skin protection a Cancer, Cough
8	Saussurea heteromalla. Hand Mazz	Kali Zira	Seeds	Direct and Paste	Carminative and Animal Bites
9	Saussurea Lappa	Minal	Stem and Roots	Juice	Antiseptic, disinfectant, anti-inflammatory and bronchial asthma
10	Solanum nigrum L.	Gabeeli	Leaves and Fruits	Powder and Direct	Jaundice, digestive problems of livestock Whooping cough, asthma, respiratory
11	Thymus serpyllum Linn	Tumuro	Leaves and the whole Plant	Powder, Juice, Direct, leaves	inflammation, deodorant, strong antiseptic, stomach trouble and fever
12	Urticaceae Urtica utilis hort. Ex de Vries	Jomi	Leaves	Direct, Paste	Hair Shampoos, vegetables, and Arthritis

Source: Field Data

The above table depicts particular information related to the scientific name and use of the medicinal plants. Each of them is further discussed to make the reader understand its importance and significance.

General Hygienic Condition

Jalalabad is ever famous for its scenic beauty and natural fresh fruits, seeds, and cultural edibles, but it is very interesting to share here that the quality of

the water that was used for drinking was observed under-rated. It is not because of the water quality but the water channels and the contamination, which becomes part of the running water. The food patterns are good but the intake, nutrients, and other ingredients always come up with an ill stomach. That is why various enlisted herbs are used for digestive-related problems. Due to severe cold weather in winter, smoking, fire smoke, and respiratory diseases were also commonly observed in the area.

Table 2*List of Herbs according to their Use*

Sr. No.	Health Issue	Name of Herb
1	Digestive Issues	Chikee, Ishkanache Minal, Gabeeli, Tumuro
2	Skin related Issues	Jomi, Buru, Datura
3	Psychological Issues Relaxant	Tumuro, Ghandair
4	Bone related Issues	Datura, Minal, Tumuro
5	Edibles	Hayyo, Tumuro
6	Respiratory Issues	Ghandair, Datura, Tumuro
7	Antiseptic	Minal, Tumuro

Source: Field Data

Impact of climatic issues

Availability

The availability of the herbs has been divided into two i.e. habitat and growing conditions. Generally, climate change affects the natural habitats of certain herbs, such as mineral, datura, Fumuro, and Ghandari, but far areas beyond human interaction or inclusion have huge amounts of such herbs. Land sliding, flash floods, and overgrazing were some of the documented reasons which decreased the number of stated herbs from Jalalabad's surrounding areas. The second thing is the ever-increasing temperature in summers and decrease in winters, according to a respondent,

'Over time temperature is changing, and we do not know what to do with it, in summers it is hotter, and in winters nights and days are unbearable.'

Growing / Production

The second issue that was documented was the rate of production or growth in the pastures or in hilly valleys. According to a respondent,

'Overgrazing is one of the major sources of concern when you talked about the production of herbs in the pastures and valleys of the Himalayas.'

Changing patterns or weather conditions on the one hand re-shaping the cropping patterns of the valleys on the other reduces the life expectancy of herbal plants. Extensive rainfalls beyond the rainy seasons, land sliding, and flash floods also destroy the production or growing rate of herbal plants in the selected valley.

Natural Course of Production

When was asked to the respondents whether they

practice any cultivation technique for herbal plants or whether they part of the natural ecosystem? All of the respondents endorsed that they do not know how to produce scientifically such plants at a huge level and if there is any sort of technique or practice, they loved to join such meetings or techniques. At the local level, AKRSP works effectively in various dimensions of human lives, but the selected respondents unfortunately were not part of any campaign or training workshop for the development or cultivation of herbal plants at an extensive level.

Preservation of Indigenous Knowledge

There is no preservation of Indigenous knowledge, it is orally transmitted from one generation to the next, those who practiced herbal medicine for a healthy life were aware of the types and forms of herbal plants and which type of extract would be useful for a particular problems like Datura was used for bone's related problems and also for skin care and also used for the Asthma patients. Same case with Tumuro which is an antiseptic, but also in the category of relaxing herb, used in Hot Tea i.e. *Qahwa* but also useful in bone-related problems. A respondent shared,

'Children of the new generation did not believe in herbal remedies, they always looking for modern medicine which not only destroys their health but also has side effects. But the natural herbs do not have any side effects, if it is not helping to settle the health do not harm the body or cause any other trouble.'

Destruction of Biodiversity

There are various potential losses due to climate change,

1. Potential loss of biodiversity due to climate change may threaten the species of available local medicinal herbs which not only facilitate local communities but also participate in biodiversity.
2. Stated all the herbs are facing challenges due to the changing environment and access of humans and high land grazing grounds, a manmade disaster of herds and population which not only destroys the ecosystem of herbs but also burdens the production.

Conclusion

Climate change presents a complex challenge for traditional herbal practices, impacting herb availability, cultivation, and cultural significance. However, through adaptation, preservation efforts, and collaboration with modern science, communities are finding ways to maintain and enhance their traditional herbal knowledge and practices. These efforts help to ensure that valuable herbal traditions continue to play a vital role in cultural and health practices despite the changing climate.

Various herbals as stated earlier used for different treatments. Respiratory diseases,

infections related to animal bites, rashes, and digestive problems were some of the common problems observed and documented in the selected area. Natives used stated herbal plants as a quick remedy for various reasons such as, they are cheap, easily available in back days nowadays it is rare due to floods and land tilting for agriculture. The indigenous knowledge about plant utilization is not only confined to the elderly individuals of the area but it also transfers to the younger generation, but due to the availability of aliphatic medicine now the influence of the younger ones is limited to the medicinal herbs. Particularly among girls the *Buru*, and *Jomi* were commonly used because they were part of their skincare methods. Due to climatic rift and overgrazing, land utilization for agriculture, cuts such plants to the verge of human pressure. The study also recommended that the conservation plan be incorporated by the government and related organizations for the development and nourishment of herbal plants. It may be suggested that strategies should be promoted for the indigenous and traditional knowledge about the uses and importance of such plans which not only strengthen the promotional activities but also the conservation of herbal plants.

References

- Abbas, Z., Khan, S. M., Alam, J., Khan, S. W., & Abbasi, A. M. (2017). Medicinal plants used by inhabitants of the Shigar Valley, Baltistan region of Karakorum range-Pakistan. *Journal of Ethnobiology and Ethnomedicine*, 13(1). <https://doi.org/10.1186/s13002-017-0172-9>
[Google Scholar](#) [WorldCat](#) [Fulltext](#)
- Abbasi, A. M., Khan, M. A., Ahmed, M., & Zafar, M. (2010). Herbal medicines used to cure various ailments by the inhabitants of Abbottabad district, North West Frontier Province, Pakistan. *Indian Journal of Traditional Knowledge*, 9(1), 175–183. <http://nopr.niscair.res.in/bitstream/123456789/7180/1/IJTK%209%281%29%20175-183.pdf>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Berkes, F. (1993). Traditional ecological knowledge in perspective. *Traditional Ecological Knowledge: Concepts and Cases*. 1: 1-9.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Bizikova, L., Parry, J., Creech, H., Karami, J., Echeverria, D., Hammill, A., Gass, P., Akoh, B., & Creech, H. (2012). *Africa transformation-ready: The strategic application of information and communication technologies to climate change adaptation in Africa*. Final Report for the African Development Bank, the World Bank, and the African Union. International Institute for Sustainable Development.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Carpenter, S., Walker, B., Anderies, J. M., & Abel, N. (2001). From metaphor to measurement: resilience of what to what? *Ecosystems*, 4(8), 765–781. <https://doi.org/10.1007/s10021-001-0045-9>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Muhammad Ishtiaq Cha, Q. He, Y.Y. Cheng, & P.G. Xiao. (2006). Ethnobotany of Medicinal Plants from Tian Mu Shan Biosphere Reserve, Zhejiang-Province, China. *Asian Journal of Plant Sciences*, 5(4), 646–653. <https://doi.org/10.3923/ajps.2006.646.653>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Hussain I, Bano A, Ullah F. (2011). Traditional drug therapies from various medicinal plants of central Karakoram national park, Gilgit-Baltistan Pakistan. *Pakistan Journal of Botany* 43(43):79-84.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Hussain, K., Nisar, M. F., Majeed, A., Nawaz, K., & Bhatti, K. H. (2010). Ethnomedicinal survey for important plants of Jalalpur Jattan, District Gujrat, Punjab, Pakistan. *Ethnobotanical Leaflets*, 2010(7), 11. <https://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?article=1670&context=eb1>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Johannes, R. (1998). The case for data-less marine resource management: examples from tropical nearshore finfisheries. *Trends in Ecology & Evolution*, 13(6), 243–246. [https://doi.org/10.1016/s0169-5347\(98\)01384-6](https://doi.org/10.1016/s0169-5347(98)01384-6)
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Karl, T. R., & Trenberth, K. E. (2003). Modern global climate change. *Science*, 302(5651), 1719–1723. <https://doi.org/10.1126/science.1090228>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Khan B, Abdukadir A, Qureshi R, Mustafa G. (2011). Medicinal uses of plants by the inhabitants of Khunjerab National Park, Gilgit, Pakistan. *Pakistan Journal of Botany* 43(5):2301-2310.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Khan, S. W. (2007). *Inventing and monitoring the flora of Haramosh and Bugrote valleys, Gilgit, Gilgit-Baltistan* (PhD thesis). University of Karachi, Karachi, Pakistan.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Krech, S. (2005). Reflections on conservation, sustainability, and environmentalism in Indigenous North America. *American Anthropologist*, 107(1), 78–86. <https://doi.org/10.1525/aa.2005.107.1.078>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Nhemachena, C., & Hassan, R. (2007). *Micro-level analysis of farmers' adaptation to climate change in Southern Africa* (IFPRI Discussion Paper No. 00714). International Food Policy Research Institute (IFPRI).
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Somah, T. P. (2013). *Climatic change impacts on subsistence agriculture in the Sudano-Sahel zone of Cameroon – Constraints and opportunities for adaptation* (PhD thesis). Brandenburgische Technical University.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Thuiller, W. (2007). Climate change and the ecologist. *Nature*, 448(7153), 550–552. <https://doi.org/10.1038/448550a>
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Veith, C., & Shaw, J. (2011). Why invest in sustainable mountain development?
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Wazir, S. M., Dasti, A. A., & Shah, J. (2004). Common medicinal plants of Chapursan Valley, Gojal II, Gilgit-Pakistan. *J Res (Science) Bahauddin Zakariya University, Multan, Pakistan*, 15, 41–43.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)
- Ziervogel, G., New, M., & Midgley, G. (2014, July 03). Climate change impact and adoption in South Africa. *Wires climate change*.
[Google Scholar](#) [Worldcat](#) [Fulltext](#)