

# A Study on Nutritional Efficacy of Pineapple Juice in the Treatment of Bronchial Asthma

Dr.Sujata Pandit Sharma \*,Dr.Brajbhushan \*\*

\* Head(R&D) FICCI Research and Analysis Centre, Delhi  
\*\* Chief Medical Officer Balaji Nirogdham Delhi

**Abstract-** The role of diet in the development of disease reported by many studies. The present study investigates the nutritional efficacy of pineapple juice in the treatment of Bronchial Asthma. This study has been conducted in a Nature cure and Yoga center, namely Hilltake Health Homes Pvt. Ltd. at Sanga, Bhaktapur, Delhi. Eighty-two (41 Male and 41 Female) subjects suffering with bronchial asthma were randomly allocated into the case and control groups. Forty-one subjects aged 30.22 ( $\pm$  6.08) years formed the intervention group, while remaining forty-one subjects aged 32.15 ( $\pm$  9.57) years constituted as control group. The general profile, medical and family history of the subject was obtained through a questionnaire cum Interview method. Intervention group was given with 100ml of pineapple juice diluted with 100ml of portable water, while the control group was given with 100ml of sweet lime juice diluted with 100ml portable water, twice a day for 90 days. Data collection was performed using a diurnal peak flow meter chart (every 10<sup>th</sup> day), a composite daily asthma score and BMI calculator (1<sup>st</sup> and 90<sup>th</sup> day). After the completion of 3 months (90 days) the results were analyzed using Microsoft Excel software. Pineapple juice significantly improved the PEFr values as well as helps in weight reduction in asthmatics, when provided in conjunction with positive lifestyle changes like yoga, breathing exercises, smoking cessation, massages etc.

**Index Terms-** Bronchial Asthma, PEFr, Pineapple, BMI, Bromelain.

## I. INTRODUCTION

Asthma is a heterogeneous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms such as wheeze, shortness of breath, chest tightness and cough that vary over time and in intensity, together with variable expiratory airflow limitation (GINA, 2014). World Health Organization (WHO) estimates 300 million people suffer from an additional 100 million may be diagnosed with asthma by 2025. It is one of the most common diseases of children and adults and is a major burden to the national health care system. As per review on Therapeutic application of Bromelain by Bitange Nipa Tochi et al. (2008), Ananas comosus (pineapple) and their extracts (bromelain) have been used clinically as anti-inflammatory, anti-tumor, anti-thrombus, control of diarrhoea and dermatological conditions. Reported review on Properties and Therapeutic application of bromelain by Rajendra Pavan et al. (2012) suggests that the main mechanism of action of Bromelain appears to be proteolysis while evidence also suggests

mucolytic activities. The present study determines the nutritional efficacy of Pineapple juice as an anti-inflammatory as well as a mucolytic agent in asthmatics.

## Objectives of the study:-

- To determine the efficacy of pineapple juice in the treatment of bronchial asthma by enhancing mucolysis, reducing inflammation, improving mucus expectoration and thereby clearing the airway.
- To prepare evidence based document for management of asthma.
- To improve awareness about treatment and management of bronchial asthma among patients and their caretakers.
- To make aware of the patients on the importance of non-pharmacological interventions in the management of bronchial asthma along with allopathic medical support system.

## II. PROCEDURES AND METHODOLOGY

The study was undertaken to assess the efficacy of pineapple juice in the treatment of Bronchial Asthma. The criterion for the selection of the locale was as follows:

### 1. Locale and Accessibility of the study:-

The study has been conducted in a Nature cure and Yoga centre namely HILLTAKE health homes Pvt. Ltd. at Sanga, Bhaktapur, Delhi. The selected participants expected from a similar socioeconomic background. The duration of the study was for 90 days, the hospital management agreed to provide a 50% discount on all prevailing facilities making the charges more affordable. Before initiation of the study, the final approval was obtained in writing from the President, HILLTAKE health homes Pvt. Ltd. at Sanga, Bhaktapur, Delhi for the smooth progress of the proceedings.

**2. Study sample:-**The sample comprised of all the patients diagnosed with Bronchial Asthma, who are on regular medications and are in a stable state.

**Table 2.1** shows the selection of sample.

Age group	15-25 yrs	25 - 35 yrs	35-45 yrs	45-55 yrs	55-65 yrs	Total (N)
<b>Intervention</b>	4	30	6	1	00	41
<b>Control</b>	8	19	9	4	1	41
<b>Mean age of the Intervention group : 30.22 (± 6.08) yrs</b>						
<b>Mean age of the Control group : 32.15 (± 9.57) yrs</b>						

**3. Sample selection and sample size:-** A total no of 90 Subjects were enrolled for study, out of which seven (7) subjects were unable to attend the study due to their personal and family priorities while one (1) subjects was disqualified from the study due to his allergy to pineapple fruit. The remaining 82 participants were randomly allocated into an Intervention and Control group using tables of random numbers.

**4. Inclusion and Exclusion criteria:**

Inclusion criteria:

- Patients diagnosed with bronchial asthma for more than 1 year.
- Those who are under regular medical care and guidance.
- Age group: 15-65 yrs.
- Non-smoker: min. since 1 year

Exclusion criteria:

- Patients with other serious co-morbid conditions along with Asthma.
- Patients with other pulmonary diseases like COPD, Bronchitis etc are excluded.
- Patients who are not stable & taking expectorants and anti-asthmatics on a daily basis.
- Allergic to pineapple or sweet lime juice

**5. Tools and techniques for data collection**

For the convenience of the participants, most of the questions were formulated in a manner to be replied with a tick (✓) mark against their reply. At some places, few words are required to be written. Assessment of willingness, general profile, family and medical history.

**6. Assessment of nutritional status (BMI)**

Body Mass Index or BMI provides a quick snapshot of one's body weight, helping to determine if he is in healthy state. BMI is a relative measure of weight according to height, and gives a broad indication of ideal weight **Phoenix Body Mass Index machine (PBMI 200)**

**7. Assessment Of Lung Functions-** Peak flow meter (Cipla Peak Flow Master) is a simple and easy to use tool. Peak flow is an indication of how well the air is moving through the lungs. In asthmatics, the breathing tubes are narrowed, resulting in lower numbers.

**8. Modified Asthma Score-**As Asthma Score is a globally accepted standardized set of 6 questions used to assess the

severity of disease in Bronchial Asthma patients (Eisner MD, Yegin A, Trzaskoma B and Xavier Basagaña, 2004). The questionnaire was modified to suit the study by providing a better insight into the progress of disease symptoms on a daily basis. The participants were asked to fill the score sheet carefully according to relief or aggravation in their symptoms on a daily basis. Score more than 18 is taken as an indicator of good asthma control.

**10. Analytical Testing and Quality Assessment Of Pine Apple Juice And Sweet Lime Juice**

Juice was extracted from mature pineapple and sweet lime fruits. The certificate of analysis was independently verified for quality and contamination was performed by HILLTAKE HEALTH HOMES laboratory for TVC = Total Visible Count, TCC = Total Coliform Count, FC = Fecal Coliform, TCS = Total Staphylococcal Count. All samples were stored at 4°C in opaque containers and analyzed for stability and degradation.

**11. Ethical Consideration-**The participants were informed about the potential benefits and possible side effects of the program and their written consent were taken before their enrollment in the study.

**12 Statistical Analyses**

Data analysis was done using SPSS (Statistical Package for Social Sciences) and Microsoft excel software. Statistical comparisons between case and control groups were done by analysis of variance t-stats and unpaired t-tests. All data's are expressed as means ± standard error of the mean, and differences are considered significant at P ≤ 0.05.

**III. RESULTS AND DISCUSSIONS**

The present study investigates to determine the nutritional efficacy of pineapple juice in the treatment of Bronchial Asthma. The detailed general, medical and nutrition history of the subject was obtained through a questionnaire cum interview method.. The BMI and PEFr were also measured for the study. The results of the study are discussed under the following headings:

- General profile of the participants
- Peak Expiratory Flow Rate (PEFR)
- Mucus Consistency Score (MCS)
- Body Mass Index (BMI)

**3.1 General profile of the participants**

The patients were managed in a nature cure and yoga centre namely HILLTAKE health homes Pvt. Ltd They were provided with light food prepared with less of the oils/spices and prescribed juices. Target group was provided with 100ml of pineapple juice (diluted with 100ml water) while comparison group was given 100ml of sweet lime juice (diluted with 100ml water) twice a day for 3 months (90 days). Parameters were assessed on 1<sup>st</sup>, 10<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup>, 50<sup>th</sup>, 70<sup>th</sup> and 90<sup>th</sup> day. The results were analyzed after the 90<sup>th</sup> day.

Gender	Intervention (N=41)	Control (N=41)	Total (N=82)
<b>Male</b>	26	14	40
<b>Female</b>	15	27	42

**Table 3.1** shows the Age-wise and gender wise distribution of the participants. Forty one participants in Intervention group consists of twenty six male and fifteen female while fourteen males and twenty seven female participants constituted forty one participants

### 3.2 Smoking history

Tobacco smoking	Subjects (N=82)	Father (N=82)	Mother (N=82)
Never	42 (51.2%)	47 (57.3%)	58 (70.7%)
Rarely	18 (21.9%)	9 (10.9%)	16 (19.5%)
Daily	22 (26.8%)	26 (31.7%)	8 (9.7%)

**Table 3.2** Shows the family history of Smoking among participants. Socio-economic status is related to incidence of asthma and respiratory symptoms in adults and education level is a risk factor for airway disorders independent of smoking and occupational airborne exposure. The relationship between tobacco smoke and bronchial asthma, both active and passive increases bronchial hyper-responsiveness. About 48.7% of subjects were reported smoking themselves and many of them were exposed to tobacco smoking during childhood inside their homes. More than half of the subjects were seemingly sensitized during childhood due to the smoking habits of their parents (42.6% -father and 29.2%-mother), while almost a similar percentage was found carrying forward or has developed the smoking habits themselves.

**3.3 Assessment of Peak Expiratory Flow Rate (PEFR)**- PEFR (peak expiratory flow rate) is a form of pulmonary function test. It measures the *fastest rate of air that can be expired*. This is a simple method of measuring airway obstruction and it will detect moderate or severe disease. The convenient size of the peak flow meter makes regular measurement of forced expiration possible at home.

Intervention( Morning/ Evening)				Control			
Pre	Post	P-value	t Stat	Pre	Post	P-value	t Stat
195.12 (±19.50)	268.78 (±35.86)	1.13E-16	-13.68	180.24 (±20.55)	215.85 (±32.56)	1.85E-11	-9.23
279.51 (±24.59)	333.96 (±34.26)	3.15E-11	-9.05	259.27 (±30.45)	277.32 (±39.88)	6.81E-05	-4.44

**Table 3.3 shows the comparison of PEFR values.**

Data shows the significant changes measured in both the groups during reading every period; morning and evening PEFR values. In every case the computed probability is smaller than our p-value of 0.05. Therefore, rejected the null hypothesis which means, there is a significant difference between two

variables.  $1.13E-16$  is the lowest probability value seen in morning Intervention group, however it is also identified that t-stat value is also less than others. Results reveal a greater improvement at  $1.13E-16$  in the morning PEFR values and in the intervention group. Where the confidence level was kept at 95% and significance value was kept 5%.

### 3.4 Assessment of Mucus Consistency Score

Excessive production of airway mucus is a cardinal feature of bronchial asthma and chronic obstructive pulmonary disease (COPD) and contributes to morbidity and mortality in these diseases. During acute attacks, the mucus secreting cells called goblet cells overreact to the inflammatory response by secreting too much mucus. This mucus clogs the bronchioles, resulting in wheezing and coughing. The findings collectively suggest that pineapple juice can dilute the stringy mucus by proteolysis and may be considered as a therapeutic agent for bronchial asthma and COPD.

Sample	Intervention	Controls
Pre	1.78 (±0.41)	1.76 (±0.44)
Post	2.54 (±0.92)	2.22 (±0.85)
P-value	8.176E-06	0.00265

**Table 3.4** shows the changes in MCS before and after the study period. Results reveal a better symptomatic relief in the pineapple juice group upon controls.

### 3.5 Assessment of Body mass index

Body Mass Index (BMI) is the ratio of weight in kilogram to the square of height in meters. A ideal body weight contributes to the better efficacy of medicines, improved lung compliance as well as overall well being. The results revealed that obese patients benefit from weight loss by improved pulmonary mechanics and a better control of airway obstruction.

Sample	Intervention	Controls
Pre	23.06 (±3.47)	25.15 (±3.90)
post	22.15 (±2.52)	23.60 (±2.64)
P-value	0.00277308	3.25E-07

**Table 3.5** shows changes in BMI observed after 90 days. Here the control group showed a better improvement, which may be attributed to the higher initial BMI values of the control group. Consistent weight loss in severely obese patients with asthma is associated with improvement in respiratory systems and lung functions.

## IV. CONCLUSION

- It has been concluded that the worst affected are children in low-income urban families. Though the risk factors for asthma and they have been clearly identified, much remains unknown about the fundamental

immunologic, genetic and environmental mechanisms underlying the development of this condition

- A Bromelain-mediated reduction may help to diminish T cell driven inflammation by inhibiting the progression of allergic disease. Bromelain may enhance regulatory cell numbers and their function leading to the resolution of disease. The characterization of the effects of Bromelain on these regulatory T cells is currently being investigated in many laboratories. Interestingly, the non-pharmacological interventions like simple physical workouts, breathing exercises, massages, steam bath seems to help both the case and control group.

#### REFERENCES

- [1] Anandan C, Nurmatov U, "Is the prevalence of asthma declining," *Allergy*(2010)..Vol 65(2):152–67.
- [2] Banks JM, Herman CT and Bailey RC, "Bromelain Decreases Neutrophil Interactions with P-Selectin, but Not E-Selectin, In Vitro by Proteolytic Cleavage of P-Selectin Glycoprotein Ligand-1." 2013; 8(11):e78988
- [3] Berkowitz B, Dimsdale J, Kuller L, Marmot M, Prochaska JHealth and Behaviour," The Interplay of Biological, Behavioural, and Societal Influences.US" National Academies Press. (2001).
- [4] Bitange Nipa Tochi , Zhang Wang "Therapeutic Application of Pineapple Protease" (Bromelain) A Review" *Pakistan Journal of Nutrition.* (2008) , Vol 7(4): 513-520.
- [5] Blackman, James A, "Developmental and Behavioural Co morbidities of Asthma in Children." *Journal of developmental behavioural and pediatrics* (2007) . Vol 28(2):92-99.
- [6] Bousquet J and Khaltaev N. Global surveillance, "Prevention and control of chronic respiratory diseases: a comprehensive approach". World Health Organization. (2007)
- [7] Castell JV Friedrich G "Intestinal absorption of un degraded proteins in men: presence of bromelain (1997) in plasma after oral intake." *The American Journal of Physiology* 273(1.1):G139–46.
- [8] Eisner MD, Yegin A and Trzaskoma B "Severity of asthma score predicts clinical outcomes in patients with moderate to severe persistent asthma" *Chest*,(2012). 141(1):58-65.
- [9] Hale LP, Chichlowski M "Dietary Supplementation with Fresh Pineapple Juice Decreases Inflammation and Colonic Neoplasia in IL-10-deficient Mice with Colitis." *Inflammatory Bowel Disease*; (2010) 16(12):2012-2021.
- [10] Jindal SK and Gupta D, "The relationship between tobacco smoke and bronchial asthma. *The Indian Journal of Medical Research* (2004). Vol 120(5):443-53.
- [11] Longo D, Fauci A, Kasper D, Hauser S, Jameson j, Loscalzo j. Harrison's, "Principles of Internal Medicine," (2011) New York: McGraw-Hill.
- [12] Michael JH, Catherine M Relationship between Asthma Severity and Obesity." *J Asthma* (2004). Vol 41(5):521-6.
- [13] Milller MR, Hankinson J, "Standardization of Spirometry." *European respiratory journal*; (2005). Vol 26(2):319-338.
- [14] Subbarao P, Mandhane PJ and Sears MR, "Asthma: Epidemiology, etiology and risk factors." *Canada Medical Association Journal*.(2009). Vol 181(9):E181-E190.
- [15] White RR, Crawley FE, Vellini M and Rovati LA "Bioavailability of 125I bromelain after oral administration to rats." *Biopharmaceutics and Drug Disposition* (1988) Vol 9:397–403.

#### AUTHORS

**First Author – Dr.Sujata Pandit,( Ph.D) Head(R&D),FICCI Research and Analysis Centre, New Delhi.E-mail-  
dr.sujatapandit@fraclabs.org,dr.sujatapandit@gmail.com**