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Scientific Rationality, Adoption and Perceived Effectiveness of Ethno-Medical Practices on Oral Care in Idukki District, Kerala

Dr. Sundaramari M[1]; Dr. Priyanka R[2*]; Dr. Simi Asharaf[3]; Dr. Rajaguru S[4]

[1]Senior Professor, School of Agriculture and Animal Sciences, The Gandhigram Rural Institute (DTBU), Gandhigram, Dindigul, Tamil Nadu.
[2,4]Guest Faculty, School of Agriculture and Animal Sciences, The Gandhigram Rural Institute (DTBU), Gandhigram, Dindigul, Tamil Nadu.
[3]Assistant Professor, Cardamom Research Station, Kerala Agricultural University, Pampadum para, Idukki, Kerala
*Corresponding Author

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Abstract— *Ethno-medicinal practices (EMPs) play a crucial role in primary healthcare among tribal communities, particularly in regions with limited access to modern medical facilities. The present study was conducted in Idukki district of Kerala with the objectives of documenting EMPs related to oral care, assessing their scientific rationality, and analyzing their adoption and perceived effectiveness among tribal farmers. The study was carried out in three phases: documentation through participatory interviews and focus group discussions, rationality assessment using expert evaluation, and field-level analysis of adoption and effectiveness among 452 tribal farmers. A total of thirteen EMPs were documented, of which eleven were found to be scientifically rational based on expert scoring. The presence of bioactive phytochemicals such as alkaloids, flavonoids, terpenes, and phenolic compounds supports their therapeutic potential in treating oral diseases. The results revealed a high level of adoption, with most EMPs practiced by more than 60 percent of respondents, and all widely adopted practices were perceived as effective. Practices involving Azadirachta indica, Centella asiatica, and Sesbania grandiflora showed higher levels of rationality, adoption, and effectiveness. The study concludes that EMPs are scientifically valid, culturally accepted, and economically viable, offering significant potential for integration into sustainable oral healthcare systems.*

Keywords— Ethno-medicinal practices, Adoption, Perceived effectiveness, Oral care, Tribal communities, Idukki, Kerala, Traditional medicine, Phytochemicals, Oral health.

I. INTRODUCTION

Oral health is a vital component of overall human well-being, yet it continues to be a neglected area, especially among rural and tribal populations where access to modern healthcare services is limited. Oral diseases such as toothache, gum infections, and mouth ulcers are among the most common and preventable health problems affecting these communities. In such contexts, traditional knowledge systems, particularly ethno-medicinal practices (EMPs), serve as an important source of healthcare. Tribal communities in Idukki district of Kerala possess a rich heritage of indigenous knowledge related to the use of medicinal plants for treating various ailments, including oral health problems. These practices are deeply rooted in cultural traditions and are passed down through generations. They are often cost-effective, locally available, and widely accepted within the community. Despite their widespread use, many of these practices remain undocumented and lack scientific validation.

In recent years, there has been growing interest in integrating traditional knowledge with modern scientific approaches to develop sustainable and accessible healthcare solutions. However, systematic efforts are required to document these practices, evaluate their scientific rationality, and assess their adoption and effectiveness at the community level. In this context, the present study aims to explore ethno-medicinal practices related to oral care among tribal farmers in Idukki district, with a focus on their documentation, validation, and field-level relevance.

II. OBJECTIVES

1) To identify and document ethno-medicinal practices (EMPs) used for oral care among tribal farmers in Idukki.
2) To scientifically assess the therapeutic potential and rationality of selected EMPs.
3) To analyze the extent of adoption and perceived effectiveness of these selected EMPs within the community.

III. RESEARCH METHODOLOGY

3.1 Phase I: Documentation of Ethno-Medicinal Practices (EMPs)

In the first phase, nine major tribal groups of the Idukki district—Muthuvan, Mannan, Malayaraya, Ullada, Hill Pulayan or Mala Pulayan, Paliyan, Malavedan, and Malapandaram—were selected for the study. The local healthcare system of these tribes primarily relies on Ethno-Medicinal Practices (EMPs). To ensure comprehensive representation, all eight blocks of the district were purposively chosen based on the high concentration and scattered population of tribal communities, after consultations with officers from the Integrated Tribal Development Project (ITDP), Thodupuzha. The inference is in line with the findings of Sundaramari et al. (2025a).

Ten traditional healers or elderly farmers aged above sixty years and possessing thirty to forty years of experience were selected from each tribal group through a judgment sampling method, with assistance from tribal promoter workers of the respective village panchayat offices. This resulted in a total of ninety respondents. Data regarding EMPs related to the treatment of oral care were collected through participatory informal interviews. To validate and refine the gathered information, nine focus group discussions (one for each tribal group) were conducted, in which a total of one hundred and eleven healers and farmers participated.

3.2 Phase II: Rationality Assessment of EMPs

In the second phase, after excluding tribe- and block-specific EMPs, a structured questionnaire was used, following a four-point continuum suggested by Husain and Sundaramari (2011), wherein the experts were asked to rate each EMP as rational based on scientific evidence, rational based on experience, irrational based on experience, or irrational based on scientific evidence, and corresponding scores of 4, 3, 2, and 1 were assigned respectively.

Out of sixty-four experts approached, fifty-two responded by returning the filled-in questionnaires. The mean score for each EMP was calculated, and EMPs with a mean score of 2.5 and above were considered rational, while those below 2.5 were classified as irrational. With the guidance of experts, the underlying principles of the rational EMPs were further explored through open-ended questions. For validation purposes, forty-three additional experts from the Dravyaguna (Ayurvedic Pharmacology) departments were also consulted.

3.3 Phase III: Adoption and Perceived Effectiveness of EMPs

In the third phase, the extent of adoption and perceived effectiveness of the EMPs among tribal farmers were assessed using a structured interview schedule. Two or more villages were selected from each of the eight blocks, namely Adimali, Devikulam, Nedumkandam, Elamdesam, Idukki, Kattappana, Thodupuzha, and Azhutha, making a total of forty village panchayats. A total of four hundred and fifty-two tribal farmers were selected through a proportionate random sampling technique. The inference is in line with the findings of Sundaramari et al. (2025b).

Adoption was operationalized as the extent to which an individual respondent had ever practiced the selected EMPs. Each EMP was described in detail to the respondents, and they were asked whether they had ever followed that practice. A score of one was given for a "Yes" response and zero for a "No." The scores were then summed up and the Adoption Index (AI) was calculated using the formula:

$$\text{Adoption Index of EMPs} = \frac{\text{Number of farmers adopted}}{\text{Number of farmers having applicability}} \times 100 \quad (1)$$

The perceived effectiveness of the EMPs, defined as the degree of usefulness perceived by the farmers in addressing oral care, was measured using the Perceived Effectiveness Index (PEI) methodology developed by Husain and Sundaramari (2011). An EMP with a mean perceived effectiveness index (MPEI) of three was considered most effective, an EMP with an MPEI of two was considered moderately effective, and an EMP with an MPEI of one was considered least effective. EMPs having an MPEI greater than two were classified as effective based on the farmers' perception, whereas those below this value were considered

less effective. Only EMPs adopted by at least fifty percent of the farmers were included for the assessment of perceived effectiveness.

IV. RESULTS AND DISCUSSION

4.1 Scientific Rationale Behind the Rational EMPs on Oral Care

Diseases of the oral cavity have been considered a major disease affecting a person's health and are regarded as the most prevalent and preventable infectious disease. In this study, thirteen indigenous herbal formulations which consisted of different plant ingredients were evaluated in terms of rationality.

In the case of oral cavity disease, thirteen EMPs were selected for the study, of which eleven practices were rated as rational by the scientists, and the remaining two practices were irrational. The rationale outlined by the scientists for the rational practices has been presented in Table 1.

TABLE 1
SCIENTIFIC RATIONALE BEHIND THE RATIONAL EMPS ON ORAL CARE

Sl. No.	EMP No.	Ethno-medical Practices	Rationale
1	EMP-1	Musk okra (*Abelmoschus moschatus* Medik.) 50 ml decoction prepared by boiling 15 gm seeds in 150 ml water mixed with 2 gm rock salt; gargling twice a day to cure mouth ulcer.	*A. moschatus* contains acetic, ambrettolic acids, furfural, higher fatty acids, chiefly palmitic acid. Other fatty acids present in the crude, volatile oil of seeds are octanoic acid, nonanoic acid, hexadecanoic acid, octadec-9-enoic acid, octadeca-9,12-dienoic acid, decanol, dodecanol, (E)-nerolidol, (ZE)-farnesol, (EE)-farnesol, decyl acetate, dodecyl acetate (ZE)-farnesyl acetate, (EE)-farnesyl acetate, (EE)-farnesyl myristate, (EE)-farnesyl palmitate, (EE)-farnesyl stearate, (EE)-farnesyl oleate, (EE)-farnesyl linoleate, and (EE)-farnesyl-16-hydroxy-hexadec-7-enoate. These possess antibacterial and antioxidant properties.
2	EMP-2	Musk okra (*Abelmoschus moschatus* Medik.) Seed powder keeping on the tooth to cure toothache.	*Abelmoschus moschatus* seed contains sesquiterpene alcohol, farnesol. The characteristic musk-like odour of oil is due to ketone, ambrettolide, a lactone of ambrettolic acid (16-hydroxy-7-hexadecenoic acid). Plant seed contains a novel trypsin inhibitor (AMTI-II) with antibacterial and antifungal activities responsible for toothache.
3	EMP-3	Prickly chaff flower (*Achyranthes aspera*) Paste prepared by grinding fresh root with rock salt to cure toothache.	*A. aspera* contains ecdysone, oleanolic acid, and n-hexacos-14-enoic acid. These possess antioxidant properties.
4	EMP-4	Neem tree (*Azadirachta indica* A. Juss.) Paste prepared by grinding 5 gm tender leaves, 2 gm tender seeds, and 1 gm fresh bark with few drops of milk with a shelf life of 1 day, taking once in a day on an empty stomach to cure mouth ulcers.	Biologically active principles isolated from different parts of the plant include: azadirachtin, melacin, gedunin, nimbidin, nimbolides, salanin, nimbin, valassin, melacin, and the seed also contains tignic acid. Pharmacological actions responsible are antibacterial, anti-yeast, antiulcer, antifungal, antiviral, etc.
5	EMP-5	Neem tree (*Azadirachta indica* A. Juss.) Tender bark pastes mixed with rock salt with a shelf life of 1 day, applying on the affected area twice a day to cure toothache.	Phenols, unsaturated sterols, triterpenes, saponin, phenolic diterpenoids, limonoids, c-secomeliacins, c-secolimonoids, polysaccharides, azadirachtin, salannin, meliantriol, and nimbin have been found in *A. indica* bark. These possess antibacterial and antioxidant activity.

6	EMP-6	Centella (*Centella asiatica* (L.) Urban) 300 ml decoction prepared by boiling 15 gm fresh leaves in 450 ml milk mixed with 20 gm palm jaggery with a shelf life of 1 hour, taking twice a day on an empty stomach to cure mouth ulcer.	Major bioactive compounds of *C. asiatica* contain highly variable triterpenoid saponins, including asiaticoside, oxyasiaticoside, centelloside, brahmoside, brahminoside, thankunoside, isothankunoside, and related sapogenins. It also contains triterpenoid acids viz. asiatic acid, madecassic acid, brahmic acid, isobrahmic acid, betulic acid, etc. These possess antioxidant and antibacterial properties.
7	EMP-7	Aromatic Ginger (*Kaempferia galanga*) Dried root powder mixed with salt with a shelf life of 1 hour; applying to the affected tooth to cure toothache.	*Kaempferia galanga* rhizome contains volatile oil, several alkaloids, starch, protein, amino acids, minerals, and fatty matter. The essential oil contains over 54 compounds. Major constituents include ethyl trans p-methoxycinnamate (16.5%), pentadecane (9%), 1,8-cineole (5.7%), γ-carene (3.3%), and borneol (2.7%). It also contains cinnamic acid, ethyl cinnamate, cinnamaldehyde, p-methoxy cinnamate, and insecticidal constituents. These together help cure toothache.
8	EMP-8	Great Basil (*Ocimum basilicum* L.) Flower paste mixed with pepper seed powder, rock salt, and sour gruel; applied to the affected tooth to cure toothache.	*Ocimum basilicum* contains essential oils, triterpenes, alkaloids, flavonoids, saponins, coumarins, steroids, glycosides, and tannins. These possess antibacterial and antioxidant properties.
9	EMP-9	Black Pepper (*Piper nigrum* L.) Paste prepared by grinding 13 tender seeds, three neem leaves, and 10 ml curd with a shelf life of 1 day; applied to cure mouth ulcers.	Black pepper contains the phytochemical piperine. *Azadirachta indica* (neem) contains nimbin, nimbanene, 6-desacetyl nimbinene, nimbandiol, nimbidol, ascorbic acid, n-hexacosanol, amino acids, benzoylazadiradione, 7-deacety, 7 benzoylgedunin, hydroxyazadiradione, meliantriol, azadirachtin, salannin, and nimbolide. These possess antioxidant and antibacterial properties.
10	EMP-10	Vegetable Hummingbird / Agate (*Sesbania grandiflora* (L.) Poiret) 30 ml decoction prepared by boiling 13 fully opened flowers in 100 ml water; shelf life 3 hours; taken twice daily to cure mouth ulcers.	Active ingredients include oleanolic acid and its methyl ester, and kaempferol-3-rutinoside. It is a good source of calcium and iron, and also Vitamin B. These possess antioxidant activity.
11	EMP-11	Yellow Fruit Nightshade (*Solanum xanthocarpum* Schrad. & H. Wendl.) 20 g root powder mixed with 12 g rice bran powder with a shelf life of 30 days; applied to the affected area to cure toothache.	**Irrational**
12	EMP-12	Toothbrush Tree (*Streblus asper*) Shoot tip paste with a shelf life of 1 day; applied to the affected area to cure toothache.	**Irrational**
13	EMP-13	Five-leaved Chaste Tree (*Vitex negundo* L.) 250 ml decoction prepared by boiling 11 fresh leaves and 1 g root in 200 ml water, mixed with 7 g rock salt; shelf life 1 day; used for gargling twice or thrice to cure mouth ulcers.	*Vitex negundo* leaves contain alkaloids (nishindine), flavonoids (luteolin, vitexin), iridoid glycosides, essential oils, vitamin C, carotene, benzoic acid, β-sitosterol, and c-glycosides. These phytochemicals exhibit anti-inflammatory and antibacterial activity

It can be observed from Table 1 that almost all the plants used in the rational EMPs were found to contain various phytochemicals such as fatty acids, phenols, terpenes, saponins, triterpenoid saponins, alkaloids, flavonoids, coumarins, etc., in different combinations as indicated against each medical practice in the above table.

These phytochemicals are indicated to possess antibacterial, antioxidant, anti-yeast, antiulcer, antiviral, and antifungal activities which would cure oral cavity-related diseases and health problems. This inference is in line with the findings of Dash et al. (2014) and Hamedi et al. (2016).

Discussion of Irrational EMPs:

EMP-11 (*Solanum xanthocarpum*) and EMP-12 (*Streblus asper*) were rated as irrational by the experts. The irrationality of EMP-11 may be attributed to the lack of sufficient scientific evidence supporting the efficacy of *S. xanthocarpum* root powder mixed with rice bran powder for toothache relief. While *S. xanthocarpum* is known for its medicinal properties in other contexts, its specific application for toothache lacks robust phytochemical and pharmacological validation. Similarly, EMP-12 (*Streblus asper* shoot tip paste) was considered irrational due to insufficient documented evidence on the antibacterial or analgesic properties of its shoot tips specifically for toothache. Although *S. asper* is traditionally used for oral care in some regions, the available scientific literature does not strongly support its efficacy for this specific application, and the potential presence of toxic compounds may also be a concern. These findings highlight the need for further phytochemical and pharmacological investigations to validate the traditional uses of these plants.

4.2 Practice-wise Rationality, Adoption, and Perceived Effectiveness of EMPs on Oral Care

There were 13 EMPs on oral care, consisting of 13 medicinal plant species. The detailed results are explained in Table 2 below.

TABLE 2

PRACTICE-WISE RATIONALITY, ADOPTION, AND PERCEIVED EFFECTIVENESS OF EMPS ON ORAL CARE

Sl. No.	EMPs	Rationality Score	Rationality Status	Adoption (%)	MPEI	Effectiveness Status
1	EMP-1	2.85	Rational	89.82	2.178	Effective
2	EMP-2	2.67	Rational	63.27	2.52	Effective
3	EMP-3	2.5	Rational	82.96	2.276	Effective
4	EMP-4	3.47	Rational	91.81	2.388	Effective
5	EMP-5	3.47	Rational	66.81	2.447	Effective
6	EMP-6	3.37	Rational	83.18	2.189	Effective
7	EMP-7	2.82	Rational	69.02	2.254	Effective
8	EMP-8	2.77	Rational	81.41	2.481	Effective
9	EMP-9	2.87	Rational	76.1	2.175	Effective
10	EMP-10	3.32	Rational	73.23	2.226	Effective
11	EMP-11	2.27	Irrational	46.46	—	—
12	EMP-12	1.72	Irrational	42.03	—	—
13	EMP-13	2.72	Rational	65.7	2.365	Effective

Note: Rationality Status: R = Rational (mean score ≥ 2.5); IR = Irrational (mean score < 2.5). MPEI = Mean Perceived Effectiveness Index. Effectiveness Status: MPEI ≥ 2.5 = Most Effective; MPEI ≥ 2.0 = Effective.

Table 2 depicts that out of the 13 EMPs related to oral care, eleven were rational and two were irrational. Five EMPs (1, 3, 4, 6, and 8), which were rational, were adopted by more than 80 percent of respondents. Of the six EMPs (2, 5, 7, 9, 10, and 13), which were adopted by 60 to 80 percent of the respondents, all are rational. Forty to sixty percent of respondents adopted two EMPs (11 and 12), which were irrational.

In short, 11 EMPs out of the 13 in total were adopted by more than 60 percent of the respondents. The table indicates that all of the EMPs on oral care were perceived as effective by the respondents.

4.3 Discussion of Highly Adopted and Perceived Effective EMPs

The following four EMPs, which were perceived as effective by the tribal farmers, had a rationality score of more than three. EMPs 4 and 5 were adopted by 91.81 and 66.81 percent of the farmers with MPEI of 2.388 and 2.447, respectively.

Azadirachta indica possesses anti-inflammatory, antipyretic, analgesic, and antibacterial activities (Biswas et al., 2002). *A. indica* stem bark contains phenolic compounds, unsaturated sterols, triterpenes, and saponins. It also has phenolic diterpenoids, limonoids, c-secomeliacins, c-secolimonoids, and polysaccharides. Due to the presence of the above phytochemicals, *A. indica* shows antiviral activity. Further, neem leaves also heal wounds, stomach ailments, and spoiled gums. *A. indica* extract significantly reduced plaque-causing bacteria (*Streptococcus mutans* and *Lactobacillus* species). *A. indica* helps to inhibit *Streptococcus mutans* (bacteria causing tooth decay) and reverses incipient carious lesions, i.e., primary dental caries (Hashmat et al., 2012). Hence, the high percentage of adoption of the two EMPs for the cure of mouth ulcer and tooth decay were reasonable.

EMP 6 was adopted by 83.18 percent of the tribal farmers with an MPEI of 2.189. *Centella asiatica* contains madecassic acid, asiatic acid, and asiaticoside, accelerating wound cicatrization and grafting. Asiaticosides promote fibroblast proliferation and extracellular matrix synthesis in ulcer healing (Singh et al., 2010). *C. asiatica* extracts and their active constituent, asiaticoside, have anti-inflammatory property brought about by inhibition of NO synthesis and facilitating ulcer healing (Jamil et al., 2007). This might be the reason for the higher adoption of the above EMP for the cure of mouth ulcers.

EMP 10 was adopted by 73.23 percent of the respondents with an MPEI of 2.226. *Sesbania grandiflora* flowers are an excellent source of calcium and a fair source of iron. They are a good source of vitamin B (Wagh et al., 2009). The advantages of vitamins present in flowers would have led to the cure of mouth ulcers and adoption of this practice.

Thirteen practices were taken up in oral care, of which eleven practices were judged as rational by the scientists. Eleven practices were adopted by more than fifty percent of the respondents and all the eleven practices were perceived as effective.

V. CONCLUSION

The study highlights the significant role of ethno-medicinal practices (EMPs) in oral healthcare among tribal communities in Idukki district. Of the thirteen practices documented, eleven were found to be scientifically rational, supported by the presence of bioactive phytochemicals such as alkaloids, flavonoids, terpenes, and phenolic compounds, which possess antibacterial, antioxidant, anti-inflammatory, and antifungal properties. A high level of adoption was observed, with most EMPs practiced by over 60 percent of the respondents, indicating strong community acceptance and reliance on traditional knowledge systems. Furthermore, all widely adopted practices were perceived as effective by the farmers, reinforcing their practical utility in managing oral health problems. Particularly, practices involving *Azadirachta indica*, *Centella asiatica*, and *Sesbania grandiflora* showed higher rationality, adoption, and effectiveness.

RECOMMENDATIONS

1) **Integration into Healthcare:** The scientifically validated EMPs should be considered for integration into primary healthcare systems serving tribal and rural populations, particularly in areas with limited access to modern medical facilities.
2) **Documentation and Preservation:** Systematic documentation and preservation of traditional knowledge should be prioritized to prevent the loss of these valuable practices with the passing of elder generations.
3) **Future Research:** Further phytochemical and pharmacological investigations, including clinical trials, are needed to isolate active compounds, elucidate mechanisms of action, and establish standardized dosages for the rational EMPs.
4) **Policy Support:** Government agencies and research institutions should support initiatives that bridge traditional knowledge with modern scientific approaches to develop sustainable and cost-effective healthcare solutions.

Overall, the study confirms that these indigenous practices are not only culturally relevant but also scientifically valid, offering significant potential for integration into sustainable and cost-effective oral healthcare strategies.

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CONFLICT OF INTEREST

The authors declare that they have no competing financial interests or personal relationships that could have influenced the work presented in this paper.

REFERENCES

[1] Biswas, K., Chattopadhyay, I., Banerjee, R. K., & Bandyopadhyay, U. (2002). Biological activities and medicinal properties of neem (*Azadirachta indica*). *Current Science*, *82*, 1336-1345.

[2] Dash, T. R., Singh, N., Gupta, D., Panwar, E., & Ramisetty, S. (2014). Role of medicinal herbs in oral health management. *International Journal of Dental and Medical Research*, *1*(2), 113-119.

[3] Hamedi, S., Sadeghpour, O., Shamsardekani, M. R., Amin, G., Hajighasemali, D., & Feyzabadi, Z. (2016). The most common herbs to cure the most common oral disease: Stomatitis recurrent aphthous ulcer (RAU). *Iranian Red Crescent Medical Journal*, *18*(2).

[4] Hashmat, I., Azad, H., & Ahmed, A. (2012). Neem (*Azadirachta indica* A. Juss): A nature's drugstore: An overview. *International Research Journal of Biological Sciences*, *1*(6), 76-79.

[5] Husain, A. S., & Sundaramari, M. (2011). Scientific rationality and perceived effectiveness of indigenous technical knowledge on coconut (*Cocos nucifera* L.) cultivation in Kerala. *Journal of Tropical Agriculture*, *49*, 78-87.

[6] Jamil, S. S., Nizami, Q., & Salam, M. (2007). *Centella asiatica* (Linn) Urban: A review. *Natural Product Radiance*, *6*(2), 158-170.

[7] Singh, S., Gautam, A., Sharma, A., & Batra, A. (2010). *Centella asiatica* (L.)—A plant with immense medicinal potential but threatened. *International Journal of Pharmaceutical Sciences Review and Research*, *4*(2), 9-17.

[8] Sundaramari, M., Priyanka, R., Simi Asharaf, & Rajaguru, S. (2025a). Scientific rationality, adoption and perceived effectiveness of ethno medicinal practices on hypotension in Idukki district, Kerala. *International Journal of Agriculture and Food Science*, *7*(12), 65-67.

[9] Sundaramari, M., Priyanka, R., Simi Asharaf, & Rajaguru, S. (2025b). Scientific rationality, adoption and perceived effectiveness of ethno medicinal practices on cancer in Idukki district, Kerala, India. *European Journal of Medicinal Plants*, *36*(5), 107-114.

[10] Wagh, V. D., Wagh, K. V., Tandale, Y. N., & Salve, S. A. (2009). Phytochemical, pharmacological and phytopharmaceutics aspects of *Sesbania grandiflora* (Hadga): A review. *Journal of Pharmacy Research*, *2*(5), 889-892.