

The Effectiveness of Insect Muscat Model to increase acceptance of albendazole in school students: A Quasi-experimental study in schools of Punjab

Seema Goyal¹, Gopal², Deepinder Singh Bajwa³, Parteek Khanna⁴, Arshdeep Singh⁵

¹Medical Officer, Polyclinic, ECHS, Sri Muktsar Sahib, Punjab

²Department of Public health, Uttaranchal College of Health Sciences, Dehradun, Uttarakhand

³Department of Biology, SD College Barnala, Punjab

⁴Ministry of Skill Development and Entrepreneurship, Indian Institute of Management Ahmedabad

⁵Community Medicine, All India institute of Medical Sciences, Rishikesh, Uttarakhand

CORRESPONDING AUTHOR

Dr Seema Goyal, Medical Officer, Polyclinic, ECHS, Sri Muktsar Sahib, Punjab 152026

Email: seemlectures726@gmail.com

CITATION

Goyal S, Gopal, Bajwa DS, Khanna P, Singh A. The Effectiveness of Insect Muscat Model to increase acceptance of albendazole in school students: A Quasi- experimental study in schools of Punjab. Journal of the Epidemiology Foundation of India. 2026;4(1):91-96.

DOI: <https://doi.org/10.56450/JEFI.2026.v4i01.011>

ARTICLE CYCLE

Received: 27/12/2025; Accepted: 21/02/2026; Published: 31/03/2026

This work is licensed under a Creative Commons Attribution 4.0 International License.

©The Author(s). 2026 Open Access

ABSTRACT

Albendazole tablet is integral part of anemia control in children as they are more prone to worm infestation due to improper hand washing & other hygiene habits. In growing years of life, kids need frequent deworming. So Govt provides deworming in school children. Teachers & ANM complains of children showing disinterest in taking albendazole so often. So an Insect Muscat Model was introduced to motivate children, improve knowledge about worm infection & hygiene and encourage albendazole in child-friendly manner. It is innovative way of educating a health topic with easy way of application. Adopting this model can help to boost fight against deworming & anemia in school children. The study assesses albendazole intake among school children in Punjab, India, using the Insect Muscat Model. Chi square analysis ($\chi^2=49.249$, $df=2$, $p<0.001$) shows significant association between experimental group & readiness to take albendazole tablets.

KEYWORDS

Deworming, Insect Muscat model, Play based education

INTRODUCTION

Worm infestations, particularly soil transmitted helminthiasis, gives a significant public challenge in developing nations(1,2). There is high prevalence of worms in pre school children .(3,4) School aged children are highly affected due to inadequate hygiene practices, such as improper hand washing and exposure to contaminated environments(5).

These infections leads to anaemia, malnutrition and impaired cognitive development due to worm infestation.(6) Albendazole tablet is integral part of anemia control in children. It is a broad spectrum anthelmintic covering roundworms, hookworms, whipworms, threadworms and tapeworms. Single 400 mg dose of albendazole shows high cure rates in ascariasis 96%, in

hookworm 96% , cure rates of 96% in ascariasis and in trichuriasis 76%. (7). Albendazole is a cornerstone in deworming programs globally, targeting parasites like hookworms & roundworms with success rate of 96%.(8)

In growing years of life, kids need frequent deworming in developing nation. (9,10). 220 million children in India aged 1-14 are at risk of intestinal worm infestations (11). The Indian government launched National De-worming Day in February 2015 under NHM to tackle worm infestation in children. So Govt of India provides deworming in all schools through mass administration of albendazole in schools through national deworming day to reduce worm burden and associated morbidity. De-worming coverage is at 43.4% while overall OD prevalence is at 19.1% (IQR 0, 28.5), respectively. (5) Teachers & ANM complain of children showing disinterest in taking albendazole tablets so often. They complain of children refusing to take albendazole (15). In this study, using a locally made Muscat with a play based education model is developed. Which motivates and educates school going children about parasites in their system in their language (17,18)

- To Study impact of insect Muscat on children for intake of Albendazole tablets.
- To create awareness about albendazole tablets among students

MATERIAL & METHODS

Study Design: Study design is cross-sectional and observational study. For the study, a locally designed insect muscat was used with pre recorded play (Children, Script of play- I am a Worm! I live very comfortably in your little belly. Today I have come to thank you. You let me live comfortably in your stomach for years. You don't wash your hands and vegetables. Walk bare footed and easily let me enter your system. making you weak and tired, but albendazole medicine and washing hands can get rid of me! You don't take albendazole given by your teachers so that I can survive and eat all your foods. I am so thankful to you for my life and your nutrition. Keep it up. Your friend, worm from your stomach) along with specially designed questionnaire for kids. 10 -12 year

old 150 school students were involved in the study

Study Setting: This study is based in local school of Sri Muktsar Sahib, Punjab.

Study duration: 1/02/2023 to 15/02/2023

Inclusion Criteria: Targets group was 10-12 years old students

Sampling Strategy: The survey form or consent forms filled by students themselves with the help of class teacher. Study was carried out in Local school of Sri Muktsar Sahib, Punjab. Non random & purposive sampling was done among 150 students of age group 10 to 12 yrs old including both males and females. Primary Data was collected by direct questionnaire method. Students were equally divided in 3 sections A, B & C. Section A was non-experimental group, Section B was semi-experimental group and section C was experimental group. All groups were from different schools. In section A, ANM handed albendazole tablets to class teacher. The teacher instructed 50 students to take albendazole tablet in class and asked the questionnaire at end of class. In section B, one ANM and Asha worker were introduced to class of 50 students. They told the side effects of worm infestation verbally and handed albendazole tablets to students in presence of class teacher and same questionnaire was asked after class. Whereas, In section C, a worm muscat dressed by MPHWS was introduced to class who acted on recorded script of 2 minutes about worm infestation, anaemia and role of albendazole tablets. At the end of play, muscat itself gave albendazole tablets to students and responses were recorded at end of class.

Sample Size: Required sample size was 150.

Data Collection Tool: Simple questionnaire was used for survey, both qualitative and quantitative approach used to collect data. It carried 4 types of question which were closed ended queries.

Data analysis: SPSS software & Manual Method

Background of Study

Soil-transmitted helminthiasis affects children in developing countries, including India, where poor hygiene practices such as inadequate handwashing and open defecation increase transmission risk. School-aged children often

suffer from malnutrition, anemia, physical growth retardation, and cognitive impairment due to heavy worm burdens.

National Deworming Day (NDD) is a key initiative by the Government of India in schools to reduce worms biannually in school children. Albendazole, a broad-spectrum anthelmintic effective against roundworms, hookworms and other helminths, is central to deworming programs globally. Despite widespread implementation, compliance remains a challenge: teachers and auxiliary nurse midwives (ANMs) report frequent refusal or low enthusiasm among children to take albendazole tablets, reducing the effectiveness of school deworming campaigns. Behavioral and educational interventions are therefore crucial to improve drug uptake and sustain public-health gains. Engaging and age-appropriate methods, such as play-based health education, have been explored in other contexts to improve awareness and behavior change among schoolchildren. However, there is limited evidence on creative, culturally tailored tools to motivate children to accept regular deworming. This gap justifies the development and evaluation of the **Insect Muscat Model**—an innovative, locally developed play-based educational approach designed to inform children about worm infestation, the health consequences of poor hygiene, and the benefits of albendazole intake in a language and format accessible to them.

This study therefore assesses albendazole intake among schoolchildren in Punjab using the Insect Muscat Model and examines whether such an intervention can increase willingness to take albendazole compared with standard approaches

1. Null Hypothesis (H₀)

H₀: There is no statistically significant association between exposure to the Insect Muscat Model and willingness of

schoolchildren to take albendazole tablets as compared to traditional methods.

This means that according to the null hypothesis, the **Insect Muscat Model does not influence or change** children’s willingness or actual intake of albendazole tablets where evidence must be strong enough to reject it.

2. Alternative Hypothesis (H₁)

H₁:There is a statistically significant association between exposure to the Insect Muscat Model and increased readiness to take albendazole tablets among schoolchildren when compared with those who receive traditional education or no intervention. This hypothesis assumes that the **Insect Muscat Model** increases albendazole acceptance or intake. This hypothesis reflects your expectation or purpose of the study: that the innovative educational method changes behavior.

- The Chi-square result you reported ($X^2 = 49.249$, $df = 2$, $p < 0.001$) suggests this alternative hypothesis is supported by the data because it shows a significant relationship.

In this case:

- **Independent variable (IV):** exposure to the Insect Muscat Model
- **Dependent variable (DV):** readiness or willingness to take albendazole tablets

The hypotheses state whether the IV affects the DV and guide the statistical analysis used (e.g., Chi-square test of association).

RESULTS

Out of the total **150 students** involved in the study (50 in each group), the intake of albendazole tablets varied markedly by intervention type:

- **Section A (Non-experimental)**
- **Section B (Semi-experimental):**
- **Section C (Experimental – Insect Muscat Model):**

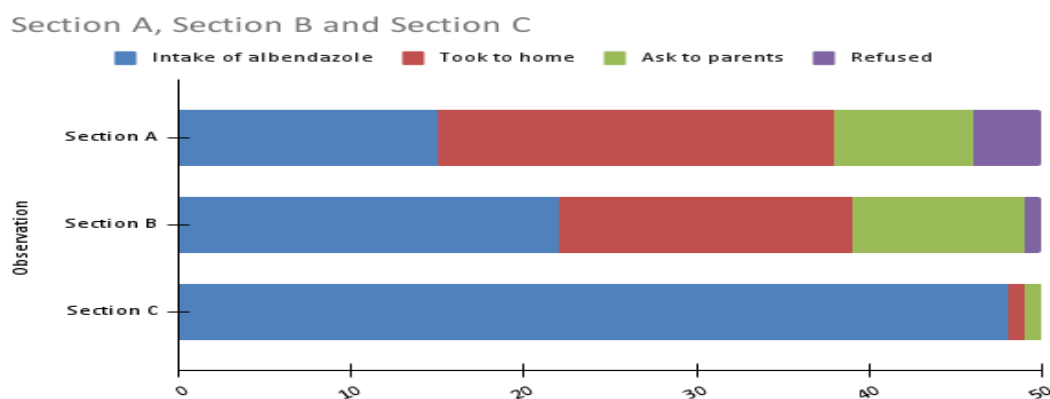
Table 1 Albendazole Intake Across Study Groups.

s. no	Questionnaire	Section-A (Non experimental)	Section-B (Semi-experimental)	Section-C (Experimental)	
1.	Ready to take Albendazole tablet	15	22	48	85
2.	Took to Home	23	17	1	41

3.	Ask from parents then take	8	10	1	19	No intake
4.	Refused	4	1	0	5	
	Total	50	50	50	150	

(Table 1) This observed versus expected frequencies supported further statistical testing.

Bar diagram 1 comparison of albendazole Intake Across all study Groups



Chi-Square Test of Association

A **Chi-Square test of independence** was used to check if albendazole intake was associated with type of intervention. The test revealed a **significant association** between group membership and albendazole intake ($\chi^2 = 49.249$, $df = 2$, $p < 0.001$), indicating that the variation in tablet intake across the three groups was unlikely to be due to chance alone.

This high level of statistical significance ($p < 0.001$) suggests that **students exposed to the Insect Muscat Model were far more likely to take albendazole tablets than those in the non-experimental or semi-experimental groups.** Tables and charts (e.g., bar diagrams) would support these findings visually by showing the differences in intake proportions across groups.

Table 2 – Chi Square test for intake of albendazole

Chi-Test	Section A	Section B	Section C	Total
Yes	6.27	1.42	13.65	21.34
No	8.21	1.85	17.85	27.91
N	14.48	3.27	31.50	49.25

Table 3- observations By manual method

Manual Method	
Significance Level	5.00%
Degrees of Freedom	2
Test Statistics	49.249
p-Value	0.000000000020218
Critical Value	#NUM!

Table 4- P-value test for intake of albendazole

Counter Check	
p-Value	0.000000000020218
Test Statistics	#NUM!

The significant association ($p < 0.001$) suggest that insect Muscat Model's impact varied across all sections. Section C' (48/50) indicates

effective education, while Section A's lower intake (15/50) and more "took to home" cases may show less engagement. Targeted

interventions can boost Compliance. The model's effectiveness in Section C can be scaled.

DISCUSSION

Summary and Interpretation of Key Findings

The results demonstrate that the **Insect Muscat Model (Section C)** increased albendazole intake among school children compared with traditional delivery methods and verbal instruction alone. The significant association between intervention type and albendazole uptake supports the hypothesis that interactive, play-based education enhances compliance in deworming programs. This study contributes to research exploring creative, child-centric health education interventions to improve treatment uptake in public health programs. By combining evidence on deworming outcomes, known compliance challenges, and the promise of game-based health education, this helps fill an important gap in applied health behavior research. After motivation with insect muscat model, acceptance rate was increased upto 96 %.

CONCLUSION

The study assesses albendazole intake among school children in Punjab, India, using the Insect Muscat Model. Chi square analysis ($\chi^2=49.249$, $df=2$, $p<0.001$) shows significant association between experimental group & readiness to take albendazole tablets. Section C showed highest compliance (48/50), while Section A had lowest (15/50). The insect model improved overall intake. Findings suggest targeted interventions can enhance deworming compliance.

RECOMMENDATION

Overall, the study shows that **innovative, education-based interventions like the Insect Muscat Model can significantly boost albendazole intake among school children**, suggesting a promising strategy to enhance deworming program effectiveness.

AUTHORS CONTRIBUTION

All authors have contributed equally.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil

CONFLICT OF INTEREST

There are no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors haven't used any generative AI/AI assisted technologies in the writing process.

REFERENCES

1. Bhandari N, Kausaph V, Neupane GP. Intestinal parasitic infection among school age children. J Nepal. Health Res council. 2011; 9: 30-32.
2. Chakrabarti S, Sitara S. R. Ajjampur, Waddington HS, Kishore A, Nguyen PH, Scott S. Deworming and micronutrient status by community open defecation prevalence: An observational study using nationally representative data from India, 2016–2018. PLoS Medicine. 2024 May 10;21(5):e1004402–2.
3. Guan M, Han B. Association between intestinal worm infection and malnutrition among rural children aged 9–11 years old in Guizhou Province, China. BMC Public Health. 2019 Sep 2;19(1).
4. Pene P, Garin JP, Rossignol JF, Coulaud JP, Mojon M. Albendazole: A New Broad Spectrum Anthelmintic. The American Journal of Tropical Medicine and Hygiene. 1982 Mar 1;31(2):263–6.
5. Kumar H, Jain K, Jain R. A study of prevalence of intestinal worm infestation and efficacy of anthelmintic drugs. Medical Journal Armed Forces India. 2014 Apr;70(2):144–8.
6. Bharti B, Bharti S, Khurana S. Worm Infestation: Diagnosis, Treatment and Prevention. Indian Journal of Pediatrics (Internet). 2018 Nov 1;85(11):1017–24.
7. Ullah I, Sarwar G, Aziz S, Khan MH. Intestinal Worm Infestation in Primary School Children in Rural Peshawar. DOAJ (DOAJ: Directory of Open Access Journals). 2009 Dec 1;
8. Babita Sheoran, Deb T, Misra S, Mayur Tuteja, Vohra A, Ritu Beniwal. Safety Profile of Mass Administration of Albendazole Among School Children (6-19 Years): A Prospective Active Surveillance Study. Current Drug Safety. 2024 Aug 28;20(3):334–40.
9. Iqbal NM, Khan NW, Khan NF, Khan NI. Albendazole and mebendazole in the treatment of ancylostomiasis in school children between the ages of 6-15 in Swat, Pakistan. Journal of the Pakistan Medical Association. 2021 Dec 29;71(8):2058–60.
10. Jourdan PM, Lamberton PHL, Fenwick A, Addiss DG. Soil-transmitted helminth infections. The Lancet. 2018 Jan;391(10117):252–65.
11. Perez F, Vallet T, Bravo Z, Callahan K, Ruiz F. Acceptability of Mebendazole Chewable Tablet in Children Aged 2 to 4 Years in Peru. Pharmaceutics

- (Internet). 2021 Dec 23 (cited 2024 Dec 12);14(1):27–7. Available from: <https://www.mdpi.com/1999-4923/14/1/27>
12. Welch VA, Ghogomu E, Hossain A, Awasthi S, Bhutta ZA, Cumberbatch C, et al. Mass de worming to improve developmental health and wellbeing of children in low-income and middle-income countries: a systematic review and network meta-analysis. *The Lancet Global Health* (Internet). 2017 Jan (cited 2020 Mar 30);5(1):e40–50.
 13. C. LK, D’Souza SrJ. Effectiveness of child to child approach to health education on prevention of worm infestation among children of selected primary schools in Manglore. *Journal of Health and Allied Sciences NU*. 2014 Mar;04(01):113–5.
 14. Sharma BK, Rai SK, Rai DR, Choudhary DR. Prevalence of intestinal parasitic infestation in school children in North eastern part of Kathmandu valley, Nepal. *Southeast Asian J Trop Med Public Health*. 2004; 35: 501-5.
 15. Jardim- Botelho A, Raff S, Rodrigues Rde A, et al. Hookworm, *Ascaris lumbricoides* infection and polyparasitism associated with poor cognitive performance in Brazilian school children. *Tropical Med Int Health*. 2008; 13: 994-1004.
 16. Rai SK Hirai K, Abe A, Nakanish M, Rai G, Uga S, et al. study on enteric parasitosis and nutritional status of school children in remote hilly areas in Nepal. *Nepal Med Coll J*. 2004; 6: 1-6.
 17. Ishiyama S, Yanagida J-I, Rai SK, Ono K. Study on intestinal parasitosis among public school children in Kathmandu, Nepal. *Bull Kobe Tokiwa Coll*. 2002; 26: 55-58.
 18. Jourdan PM, Lamberton PHL, Fenwick A, Addiss DG. Soil-transmitted helminth infections. *The Lancet*. 2018 Jan;391(10117):252–65.