



# Factors Influencing Occupational Perception of Agricultural Undergraduates towards Agriculture as a Profession

**Boda Mahesh Naik<sup>a++\*</sup>, Rupinder Kaur<sup>b#</sup> and Athira Raveendran<sup>c†</sup>**

<sup>a</sup> ICAR-National Academy of Agricultural Research Management, Hyderabad, Telangana, India.

<sup>b</sup> Department of Extension Education, Punjab Agricultural University, Ludhiana, Punjab, India.

<sup>c</sup> Department of Economics, M.S. University, Tirunelveli, Tamil Nadu, India.

## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

## Article Information

DOI: <https://doi.org/10.9734/ajaees/2024/v42i82526>

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/120773>

**Original Research Article**

**Received: 03/06/2024**

**Accepted: 07/08/2024**

**Published: 09/08/2024**

## ABSTRACT

India's economy heavily relies on agriculture, with a significant portion of the population dependent on it for their livelihood. Despite its potential for agribusiness, youth interest in agriculture is waning. Engaging and retaining young people in this sector is crucial for future food security. This study

<sup>++</sup> Senior Research Fellow;

<sup>#</sup> Professor;

<sup>†</sup> Research Scholar;

\*Corresponding author: E-mail: maheshnaik9995@gmail.com;

**Cite as:** Naik, Boda Mahesh, Rupinder Kaur, and Athira Raveendran. 2024. "Factors Influencing Occupational Perception of Agricultural Undergraduates towards Agriculture As a Profession". *Asian Journal of Agricultural Extension, Economics & Sociology* 42 (8):11-18. <https://doi.org/10.9734/ajaees/2024/v42i82526>.

examines the determinants affecting the occupational perception of agriculture undergraduates towards agriculture as a profession. Understanding these relationships is vital for supporting the farming community in the future. A sample of 120 final-year B.Sc. Agriculture students were selected using random sampling from Punjab Agricultural University (PAU), Ludhiana, and Professor Jayashankar Telangana State Agricultural University (PJTSAU), Hyderabad. Data were collected through questionnaires distributed to the respondents. Statistical tools like correlation coefficient and chi-square analysis were used to test the relationship between variables. From the study, it was found that family monthly income, landholding, and family background were significantly correlated with the perception of agricultural undergraduates towards agriculture as a profession. Additionally, there was an association between respondents' family size and their perception of agriculture as a profession. To boost agriculture graduates' engagement in agriculture, the government should prioritize improving the financial and social conditions of agricultural families and increasing awareness of agribusiness opportunities among agricultural graduates.

*Keywords: Agriculture; occupation; perception; profession; relationship.*

## 1. INTRODUCTION

Agriculture drives growth in many developing countries, making its development one of the most effective strategies for reducing hunger and poverty [1,2]. India's economy is particularly heavily reliant on agriculture, with a large portion of the population depending on it for their livelihood. Approximately 50 percent of the population is directly or indirectly involved in agriculture [3]. India is a youthful nation with a population exceeding 1.41 billion, according to the latest United Nations data from World Meter. Currently, over 65% of the population is under the age of 35. Despite being an agriculture-based country with immense potential for agribusiness, the interest of young people in agriculture is waning. Engaging and retaining youth in this sector is crucial for the nation's future food security. It is essential to attract young people and rekindle their interest, encouraging them to aspire to become agri-entrepreneurs or to choose self-employment as a career [4]. India is a global leader in the agriculture sector, serving as the primary source of livelihood for approximately 55% of its population. The country boasts the world's largest buffalo herd and the most extensive areas planted with wheat, rice, and cotton. India is also the leading producer of milk, pulses, and spices, and ranks second in the production of fruits, vegetables, tea, farmed fish, cotton, sugarcane, wheat, rice, and sugar. With the second-largest agricultural land area globally, the sector employs nearly half of the nation's workforce, making farmers essential to our sustenance [5]. The current state of Indian agriculture is the result of several significant revolutions, including the Green Revolution (food

grains), the White Revolution (milk), the Yellow Revolution (oil seeds), the Blue Revolution (fishery), the Silver Revolution (eggs), and Grey Revolution (fertilizers). These advancements highlight the impact of science and technology, applied by skilled professionals in the agriculture sector. This progress has been facilitated by agricultural education, which has produced trained experts dedicated to serving the field [6]. In this context, aside from administration and research, agricultural education plays a crucial role in enhancing agricultural production specifically and developing rural society more broadly. Consequently, the advancement of agriculture can be seen as dependent on the quality and quantity of trained manpower necessary for implementing various agricultural development activities [7].

Agricultural universities have been established across the country to provide education in agriculture and related fields, aiming to develop skilled professionals to advance the nation's agriculture. Currently, there are 63 state agricultural universities, 4 deemed universities, and 3 central agricultural universities in India. Each year, these institutions enroll approximately 15,000 students in undergraduate programs, around 7,000 students in various postgraduate courses, and about 1,700 students for doctoral degrees. Additionally, numerous private colleges, both affiliated and non-affiliated with various State Agricultural Universities (SAUs), also enroll a significant number of students annually [4]. The Bachelor of Science degree in agriculture is a foundational step in agricultural education. It aims to equip students with the knowledge, skills, and experience necessary to become valuable assets in the

agriculture sector [8]. Despite agriculture offering numerous employment opportunities after graduation, there is a prevailing belief that farming is a non-professional, less prestigious, and less profitable career choice for graduates [6]. A study by Mehta et al. [9] revealed that agriculture graduates preferred civil and administrative jobs the most, followed by positions in educational and research institutions, state government jobs, agro-based public sector roles, agro-based private sector roles, and self-employment. General jobs and farming were the least preferred career options. Studies by Suryawanshi et al. [10], Shivacharan [11], Narain et al. [12], and Yadav [13] also highlighted the lukewarm attitude of youth and students toward agriculture, which poses a concern and challenge for the future of agriculture in India. Harnessing the potential of and retaining youth, especially agriculture graduates, in the sector could be a solution to issues of unemployment, poverty, and sustainability. Given the above facts, no study exists regarding the factors influencing the occupational perception of agricultural undergraduates. Thus the study was conducted to assess factors influencing the occupational perception of agriculture undergraduates of Punjab Agricultural University, Ludhiana, and Professor Jayashankar Telangana State Agricultural University, Hyderabad towards agriculture as a profession.

## 2. MATERIALS AND METHODS

The population of the study was all the final year B.Sc. agricultural students of the two-state agricultural universities *i.e.* College of Agriculture, Punjab Agricultural University (PAU), Ludhiana, Punjab, and the College of Agriculture, Professor Jayashankar Telangana State Agricultural University (PJ TSAU), Hyderabad, Telangana. These universities were selected purposefully for the study. A sample of 120 final-year B.Sc. Agriculture (Hons) 6-year program and B.Sc. (Agri.) 4-year program students were randomly selected from both State Agricultural Universities (SAUs). The list of students was obtained from the Deans of the Colleges of Agriculture at both universities. From the 120 students, 60 were selected from PAU, Ludhiana, with 30 students from the B.Sc. Agri. (Hons) 6-year program and 30 students from the B.Sc. (Agri.) 4-year program. Since the B.Sc. Agri. (Hons) 6-year program was not available at PJ TSAU in 2019, a sample of 60 B.Sc. (Agri.) students were selected from the university,

making a total sample size of 120 respondents. An *ex-post facto* research design was employed for this study.

A structured questionnaire was used to collect information for the study, and the data collected was analyzed using descriptive statistics such as frequency counts and percentages. Respondents were classified into different categories based on the maximum and minimum scores obtained, using the range method. Karl Pearson's Correlation Coefficient and chi-square analysis were employed by using SPSS software to study the effect of independent variables on the occupational perception of agriculture undergraduates towards agriculture as a profession.

## 3. RESULTS AND DISCUSSION

### Socio-personal profile of the respondents:

Results from Table 1 show that nearly 56.67% of the respondents were in the age range of 23-25 years, while 43.33% were in the 20-22 year category. At PAU, Ludhiana, the majority of respondents (60.00%) were aged 23-25, with 40% in the 20-22 age group. Similarly, at PJ TSAU, Hyderabad, 53.33% of respondents were aged 23-25, and about 47% were in the 20-22 age group. Additionally, 56.67% of the respondents were male, and 43.33% were female. The gender distribution was consistent at both PAU, Ludhiana, and PJ TSAU, Hyderabad, with 56.67% males and 43.33% females at each institution. The data also reveal that 81.67% of respondents were hostellers, while 18.33% were day-scholars. Specifically, at PAU, Ludhiana, 83.33% were hostellers and 16.67% were day-scholars, whereas, at PJ TSAU, Hyderabad, 80% were hostellers and 20% were day-scholars.

Analyzing the academic performance of respondents, it was found that 90.83% had secured more than 80% in their matriculation exams, 7.50% had secured more than 70%, and only 1.66% had secured more than 60%. In their senior secondary exams, 85.83% had secured more than 80%, 12.50% had secured more than 70%, and 1.66% had secured more than 60%. For the B.Sc. Agriculture (III year), 52.50% of respondents scored more than 70%, 42.50% scored more than 80%, and 5% scored more than 60%. At PAU, Ludhiana, 86.66% of respondents scored more than 80% in matriculation, 10% scored more than 70%, and 3.33% scored more than 60%. In senior secondary exams, 75% scored more than 80%,

**Table 1. Profile of selected respondents**

<b>S. No</b>	<b>Variables</b>	<b>PAU, Ludhiana (n<sub>1</sub>=60)</b>	<b>PJTSAU, Hyderabad (n<sub>2</sub>=60)</b>	<b>Total respondents (n=120)</b>
<b>1.</b>	<b>Age (Years)</b>	<b>f (%)</b>	<b>f (%)</b>	<b>f (%)</b>
a.	20-22	24 (40.00)	28 (46.67)	52 (43.33)
b.	23-25	36 (60.00)	32 (53.33)	68 (56.67)
<b>2.</b>	<b>Gender</b>			
a.	Male	34 (56.67)	34 (56.67)	68 (56.67)
b.	Female	26 (43.33)	26 (43.33)	52 (43.33)
<b>3.</b>	<b>Residential status</b>			
a.	Hosteller	50 (83.33)	48 (80.00)	98 (81.67)
b.	Day scholar	10 (16.67)	12 (20.00)	22 (18.33)
<b>4</b>	<b>Academic level</b>			
a.	Matric	>80 per cent 52(86.66)	>80 per cent 57(95.00)	>80 per cent 109(90.83)
		>70 per cent 6(10.00)	>70 per cent 3(5.00)	>70 per cent 9(7.50)
		>60 per cent 2(3.33)	>60 per cent 0(0.00)	>60 per cent 2 (1.66)
b.	Senior	>80 per cent 45(75.00)	>80 per cent 58(96.66)	>80 per cent 103 (85.83)
	Secondary	>70 per cent 13(21.66)	>70 per cent 2(3.33)	>70 per cent 15 (12.50)
		>60 per cent 2(3.33)	>60 per cent 0(0.00)	>60 per cent 2 (1.66)
c.	B.Sc. Agri. (III/V year)	>80 per cent 18(30.00)	>80 per cent 33(55.00)	>80 per cent 51 (42.50)
		>70 per cent 37(61.66)	>70 per cent 26(43.33)	>70 per cent 63 (52.50)
		>60 per cent 5(8.33)	>60 per cent 1(1.66)	>60 per cent 6 (5.00)
<b>5.</b>	<b>Family monthly income (Rs)</b>			
a.	<30,000	5 (8.33)	24 (40.00)	29 (24.17)
b.	30,000-60,000	19 (31.67)	12(20.00)	31(25.83)
<b>6.</b>	<b>Family background</b>			
a.	Urban	22 (36.67)	34 (56.67)	56(46.67)
b.	Rural	38 (63.33)	26 (43.33)	64 (53.33)
<b>7.</b>	<b>Family size (members)</b>			
a.	3-5	49 (81.67)	56 (93.33)	105 (87.50)
b.	6-8	11 (18.33)	4 (6.67)	15 (12.50)
<b>8.</b>	<b>Family occupation</b>			
a.	Farming	16 (26.67)	15 (25.00)	31 (25.83)
b.	Subsidiary (Dairy)	3 (5.00)	3 (5.00)	6 (5.00)
c.	Non-farming			
	Business	14 (23.33)	13 (21.67)	27 (22.50)
	Service	27 (45.00)	29 (48.33)	56 (46.67)
<b>9.</b>	<b>Family ownership of land</b>			
a.	Yes	36 (60.00)	41 (68.33)	77 (64.16)
b.	No	24 (40.00)	19 (31.67)	43 (35.84)
<b>10.</b>	<b>Size of operational land holding (acres)</b>			
a.	Marginal (<2.5)	3 (8.33)	8 (19.51)	11 (14.28)
b.	Small (2.5-5)	13 (36.11)	15 (36.50)	28 (36.36)
c.	Semi-Medium (5-10)	20 (55.55)	18 (43.90)	38 (49.35)
<b>11.</b>	<b>Working experience on the farm</b>			
a.	Had experience	14 (23.33)	11 (18.33)	25 (20.83)
b.	Had no experience	46 (76.67)	49 (81.67)	95 (79.17)

\* Figures given in parentheses indicate percentages

21.66% scored more than 70%, and 3.33% scored more than 60%. For the latest academic performance, 61.66% scored more than 70%, 30% scored more than 80%, and 8.33% scored

more than 60%. At PJTSAU, Hyderabad, 95% of respondents scored more than 80% in matriculation, 5% scored more than 70%, and none scored more than 60%. In senior

secondary exams, 96.66% scored more than 80%, 3% scored more than 70%, and none scored more than 60%. For the latest academic performance, 55% scored more than 80%, 43.33% scored more than 70%, and 1.66% scored more than 60%. Qualitatively, PJTSAU, Hyderabad students performed better than those from PAU, Ludhiana.

Income-wise, half of the respondents belonged to the income category of more than Rs 60,000, 25.83% to Rs 30,000-60,000, and 24.16% to less than Rs 30,000. At PAU, Ludhiana, 60% belonged to the income category of more than Rs 60,000, 31.67% to Rs 30,000-60,000, and 8.33% to less than Rs 30,000. At PJTSAU, Hyderabad, 40% belonged to the income category of more than Rs 60,000, 20% to Rs 30,000-60,000, and 40% to less than Rs 30,000. Regarding family background, 53.33% of respondents were from rural areas, and 46.67% were from urban areas. At PAU, Ludhiana, 63.33% were from rural areas, and 36.67% were from urban areas. At PJTSAU, Hyderabad, 56.67% were from urban areas, and 43.33% were from rural areas. Family size analysis showed that 87.50% of respondents belonged to families of 3-5 members, and 12.50% belonged to families of 6-8 members. At PAU, Ludhiana, 81.67% were from families of 3-5 members, and 18.33% from families of 6-8 members. At PJTSAU, Hyderabad, 93.33% were from families of 3-5 members, and 6.67% from families of 6-8 members.

Occupational analysis indicated that 25.83% of respondents had farming as the family occupation, 5% had dairy as a subsidiary occupation, 46.67% had service sector jobs, and 22.50% had business as the family occupation. At PAU, Ludhiana, 26.67% had farming, 5% had dairy, 45% had service sector jobs, and 23.33% had business. At PJTSAU, Hyderabad, 25% had farming, 5% had dairy, 48.33% had service sector jobs, and 21.67% had business. Agricultural land ownership was reported by 64.16% of respondents, with 35.84% not owning any agricultural land. At PAU, Ludhiana, 60% owned agricultural land, whereas at PJTSAU, Hyderabad, 68.33% owned agricultural land. In terms of operational landholding, 49.35% had 5-10 acres, 36.36% had 2.5-5 acres, and 14.28% had less than 2.5 acres. At PAU, Ludhiana, 55.55% had 5-10 acres, 36.11% had 2.5-5 acres, and 8.33% had less than 2.5 acres. At PJTSAU, Hyderabad, 43.90% had 5-10 acres,

36.50% had 2.5-5 acres, and 19.51% had less than 2.5 acres.

Finally, 20.83% of respondents had working experience on farms, while 79.17% did not. At PAU, Ludhiana, slightly more than 20% had farm work experience, whereas at PJTSAU, Hyderabad, 18.33% had farm work experience. Most students engaged in activities such as sowing seeds, weeding, cotton picking, and harvesting vegetables.

#### **Relationship between independent variables and students' perception of agriculture as a profession:**

An analytical look at Table 2 made it clear that for respondents at PAU, Ludhiana, and PJTSAU, Hyderabad age was found to have a non-significant correlation with the perception of agricultural undergraduates towards agriculture as a profession. Whereas academic performance and working experience on a farm were non-significantly correlated with occupational perception in both universities: PAU, Ludhiana, and PJTSAU, Hyderabad. The relationship between monthly income and family background with occupational perception towards agriculture as a profession was significantly correlated at PAU, Ludhiana, but non-significantly correlated at PJTSAU, Hyderabad, indicating that students from PAU were more likely to be interested in agriculture concerning their monthly income and background. The relationship between operational landholding and occupational perception towards agriculture as a profession was significantly correlated at both universities: PAU, Ludhiana, and PJTSAU, Hyderabad. The size of landholding exhibited a positive relationship, as students with larger landholdings showed a greater inclination towards pursuing agriculture as a profession.

#### **Association between family size and students' perception of agriculture as a profession:**

Using chi-square analysis, the association between family size and the perception of agricultural undergraduates towards agriculture as a profession was examined at both universities. The data from Table 3 indicates that at PAU, Ludhiana, more than half of the respondents from families with 3-5 members showed a likely perception of agriculture as a profession, followed by 20% of respondents who were not likely to perceive it as a profession and 10% who were more likely to perceive it positively. At PJTSAU, Hyderabad, 60% of respondents had a likely perception of

**Table 2. Relationship between socio-personal characteristics and perception of agriculture**

Independent Variables	Correlation coefficient	
	(r)	
	PAU, Ludhiana (n <sub>1</sub> =60)	PJTSAU, Hyderabad (n <sub>2</sub> =60)
Age	0.144	0.177
Academic Performance	0.172	0.126
Family Monthly Income	0.362*	0.078
Land Holding	0.283*	0.296*
Family background	0.278*	0.190
Working experience on the farm	0.156	0.149

\*Significant at 0.05 level

**Table 3. Distribution of respondents according to the association between family size and perception of agriculture**

Family size	PAU, Ludhiana (n <sub>1</sub> =60)			χ <sup>2</sup> value	PJTSAU, Hyderabad (n <sub>2</sub> =60)			χ <sup>2</sup> value
	Not Likely	Likely	More Likely		Not Likely	Likely	More Likely	
	f (%)	f (%)	f (%)		f (%)	f (%)	f (%)	
<b>3-5</b>	12(20.00)	31(51.70)	6(10.00)	<b>0.376</b>	5(8.30)	36(60.00)	15(25.00)	<b>6.590</b>
<b>6-8</b>	3(5.00)	6(10.00)	2(3.30)	<b>2. d.f.</b>	2(3.30)	2(3.30)	0(0.00)	<b>2.d.f.</b>

\*Significant at 0.05 level

agriculture as a profession, one-fourth had a more likely perception, and only 8.3% were not likely to perceive it as a profession. For families with 6-8 members, at PAU, Ludhiana, 10% of respondents had a likely perception, 5% had a not likely perception, and approximately 3% had a more likely perception towards agriculture as a profession. In contrast, at PJTSAU, Hyderabad, an equal number of respondents had likely and not likely perceptions towards agriculture as a profession, with none falling into the more likely perception category. The chi-square analysis revealed no significant association between family size and perception of agriculture as a profession at PAU, Ludhiana. However, at PJTSAU, Hyderabad, a significant association was found, suggesting that family size influences agricultural undergraduates' perceptions towards agriculture as a profession at this university.

#### 4. CONCLUSION

The study concluded that the independent variables, namely family monthly income, landholding, and family background, showed a significant difference in the respondents'

perception of agriculture as a profession. Furthermore, there was an association between the respondents' family size and their perception of agriculture as a profession. Concerning socio-personal profile majority of respondents were hostellers and were in the age group of 23-25 years. The data indicated that male students were more compared to female students. A substantial proportion of respondents secured distinction at both the matriculation and senior secondary levels, and their academic performance in the B.Sc. (Agri.) program was predominantly first class. Most of the respondents came from rural family backgrounds. Half of the respondents reported self-sufficient family income per month and belonged to families with semi-medium landholdings. However, the majority of respondents lacked practical working experience on the farm. To enhance agriculture graduates engagement in agriculture and ensure future food security, it is recommended that government should focus on improving the financial and social conditions of agricultural families and raising awareness about the potential of agribusiness among young students.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors hereby declare that generative AI technologies, such as OpenAI's ChatGPT version 3.5, were used for language improvement during the writing or editing of the manuscripts.

## ACKNOWLEDGEMENT

Authors are thankful to College of Agriculture, Punjab Agricultural University, Ludhiana for providing the necessary facilities to conduct this study. I acknowledge the Indian Council of Agricultural Research for providing financial support to carry out my research work timely. I would like to thank my supervisor for her support during my study. I would also like to acknowledge final year B.Sc. agriculture students from PJTASU, Hyderabad and PAU, Ludhiana for providing the required information for my data collection.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Agumagu AC, Ifeanyi-obi CC, Agu C. Perception of agriculture students towards farming as a means of sustainable livelihood in Rivers state, Nigeria. *International Journal of Agriculture and Rural Development*. 2019;22: 4143-4148.
2. Amungwa FA, Baye FM. Appraisal of the agricultural extension system. *Asian Journal of Agricultural Extension Economics and Sociology*. 2014;2: 530-543.
3. Naik BM, Kaur R, Mohapatra L. Occupational perception of agricultural undergraduates of PAU, Ludhiana and PJTSAU, Hyderabad towards agriculture. A comparative study. *Indian Journal of Extension Education*. 2021;57: 215-218.
4. Rai U, Ghosh S, Rai B, Das L, Mondal S. Attitude of the agriculture graduates and general graduates towards agricultural entrepreneurship and self-employment. *The Pharma Innovation*. 2022;11: 673-677.
5. India Brand Equity Foundation. *Agriculture in India: Information about Indian agriculture and its importance*. Ministry of Commerce and Industry, Government of India; 2024
6. Dayalan D, Devarani, Singh RJ, Feroze SM. Attitude of agriculture collegian towards opting farming as a profession. *Indian Journal of Extension Education*. 2018;54:42-47.
7. Naik BM, Kaur R, Mohapatra L. Preferences of agricultural undergraduates of PAU, ludhiana and PJTSAU, hyderabad towards agriculture as a profession. *International Journal of Current Microbiology and Applied Sciences*. 2019;8:1787-1796.
8. James OJ, Denis O. Factors influencing career choice among undergraduate Students in an African university context: The case of agriculture students at Makerere University, Uganda, *Journal of Dynamics in Agricultural Research*. 2015;2: 12-20.
9. Mehta SK, Godara AK, Shivrain DK, Singh N. The perceived preferences and priority pattern of farm graduates towards higher agricultural education vis-a-vis employment, *Journal of Social Sciences*. 2011;27:201-208.
10. Suryawanshi DB, Thorat KS, Ban SH. Vocational preference of bhil youth, *Mysore Journal of Agricultural Sciences*. 2010;44(3):623-627.
11. Shivacharan G. A study on entrepreneurial behavior and attitude of rural youth towards agri entrepreneurship, M.Sc. Thesis, Acharya N.G. Ranga Agricultural University, Rajendra Nagar, Hyderabad; 2014.
12. Narain S, Singh AK, Singh SRK. Perception of farming youth towards farming, *Indian Research Journal of Extension Education*. 2015;15(2): 105-109.

13. Yadav A. Attitude of students towards agriculture as a profession, International Journal of Agricultural Sciences and Research. 2016;6(6):177-182.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2024): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<https://www.sdiarticle5.com/review-history/120773>