ORIGINAL ARTICLE

Educational Intervention on Knowledge of Autism Spectrum Disorder among Accredited Social Health Activists in a Rural Field Practice Area of a Postgraduate Public Health Institute in West Bengal, India

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ABSTRACT

Autism Spectrum Disorder (ASD) is an increasingly recognized neurodevelopmental disorder affecting a significant number of children worldwide. In India, limited awareness and inadequate developmental screening contribute to delayed identification, particularly in rural settings. Accredited Social Health Activists (ASHAs), as frontline health workers, can play an important role in early identification of developmental disorders if adequately trained. The present study aimed to assess baseline knowledge regarding autism among ASHA workers in West Bengal, India, and to evaluate the effect of a structured educational intervention on their knowledge. An institution-based quasi-experimental study was conducted in the Rural Health Unit and Training Centre, Singur, West Bengal, India, using a before-and-after design without a control group, between March 2025 and March 2026. The study included 58 ASHA workers selected by simple random sampling. Baseline knowledge was assessed using the validated Knowledge about Childhood Autism among Health Workers (KCAHW) questionnaire. A structured educational intervention was delivered using PowerPoint presentations, posters, flipcharts, and leaflets in the local language. Knowledge was reassessed immediately after the intervention and at three-month follow-up. The mean baseline knowledge score was 0.79±1.94 with a median of 0. Knowledge improved significantly immediately after the intervention, with a mean score of 8.17±2.69 and median of 8. At three-month follow-up, the mean score was 5.83±2.86 with a median of 5. Friedman test showed a statistically significant difference across the three time points ($p<0.001$). Domain-wise analysis demonstrated substantial improvement across all domains following the intervention, with partial decline but sustained retention at three months. Baseline knowledge regarding autism among ASHA workers was inadequate, highlighting a critical gap in community-level capacity. Structured educational interventions can strengthen knowledge and support early identification and referral. Integrating autism-related training into routine ASHA capacity-building programs may enhance developmental surveillance and improve access to care for children in rural settings.

Keywords: Autism spectrum disorder, health education, community health workers, capacity building

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INTRODUCTION

Autism is increasingly recognized as a major challenge in global mental health that warrants urgent attention. Despite growing awareness, most of the existing phenotypic knowledge, biological understanding, and evidence-based intervention studies on autism spectrum disorder (ASD) originate from Western countries. There remains limited evidence from low- and middle-income countries (LMICs), including India, where infrastructural limitations and operational challenges in conducting research have contributed to a widening knowledge gap.[1] Consequently, a substantial proportion of cases remain undiagnosed, particularly in rural and resource constrained settings where access to specialized services is limited.

Autism spectrum disorder (ASD), once considered a rare condition, is now acknowledged to be more common than previously thought. In India, approximately 1 in 65 children aged two to

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nine years are estimated to be affected.[2] However, regional studies present varying estimates; for instance, a study conducted in Himachal Pradesh reported a prevalence of 0.9 per 1000 children aged 1 to 10 years.[3] Although this appears lower than global estimates, it still represents a significant public health concern. Limited systematic epidemiological research in India suggests that many cases remain undetected, with those presenting to healthcare facilities likely representing only the tip of the iceberg.[4] Notably, studies have reported comparable prevalence in urban and rural areas, 0.09 percent (95 percent CI 0.03 to 0.17) and 0.11 percent (95 percent CI 0.04 to 0.16), respectively, indicating that autism is not confined to urban populations.[3]

Globally, recent estimates from the Centres for Disease Control and Prevention (CDC), USA, indicate that nearly one in 36 children in the United States meet the diagnostic criteria for ASD,[5] reflecting a marked increase from earlier estimates of approximately one in 100 children less than two decades ago.[6] ASD encompasses a group of neurodevelopmental disorders characterized by persistent deficits in social communication and interaction, along with restricted and repetitive patterns of behaviour, interests, or activities.[7] The classical description by Kanner highlights impairments in social interaction, qualitative communication deficits, and restricted repetitive behaviours with onset before three years of age.[8]

Children with ASD often exhibit difficulties in understanding social cues, limited social reciprocity, lack of imaginative play, impaired imitation, and a preference for solitary activities. Many may also present with sensory abnormalities, rigid behavioural patterns, hyperactivity, attention problems, mood disturbances, anxiety, and seizures.[9] ASD is a complex developmental disorder with multifactorial aetiology, including genetic, perinatal, and environmental influences affecting early brain development. Importantly, extensive research has conclusively demonstrated that the measles, mumps, and rubella vaccine does not cause autism, and earlier claims suggesting such a link were based on flawed and biased studies.[10]

In the Indian context, autism was historically perceived as a Western disorder, contributing to its under recognition and delayed diagnosis. However, increasing awareness among healthcare professionals and media exposure has led to a rise in reported cases.[11] Despite this, routine developmental screening and surveillance for ASD are not consistently practiced.[12] Guidelines from the American Academy of Pediatrics recommended regular developmental screening at 15, 18, and 24 months, as early features of autism typically emerge during the second year of life.[13] Inadequate knowledge among healthcare providers has been identified as a key barrier to early identification and timely intervention.[14] Since provider awareness significantly influences the age at diagnosis and subsequent management, strengthening their knowledge base is critical.

Early diagnosis and timely intervention are essential for improving long term outcomes in children with ASD. Although there is no definitive cure, early psychosocial and behavioural interventions have been shown to enhance communication, social functioning, and adaptive skills.[15] Integrating developmental monitoring within routine maternal and child health services is therefore crucial. In India, Accredited Social Health Activists serve as frontline community health workers and play a pivotal role in delivering primary healthcare services, particularly in rural areas. Their close engagement with the community places them in an advantageous position to identify early developmental concerns and facilitate timely referrals. Evidence suggests that targeted educational interventions can significantly improve knowledge and early detection practices among primary healthcare workers.[16,17] However, there is a paucity of interventional studies focusing on ASHA workers, especially in the state of West Bengal.

Given the increasing burden of ASD, the lack of comprehensive epidemiological data, and the critical role of ASHA workers in rural healthcare delivery, there is a clear need to assess and strengthen their knowledge regarding autism. In this context, the present study was undertaken to assess the baseline knowledge regarding autism among ASHA workers in Rural Health Unit and Training Centre, Singur, the rural field practice area of All India Institute of Hygiene & Public Health, Kolkata, West Bengal, India, and to

evaluate the effect of a structured educational intervention on their knowledge. By addressing this gap, the study seeks to contribute to improved early identification, timely referral, and better long-term outcomes for children with ASD.

METHODS

This institution-based interventional study with a quasi-experimental design (before and after design without a control group) was conducted at the Rural Health Unit and Training Centre, Singur, which serves as the rural field practice area of the All-India Institute of Hygiene and Public Health, Kolkata, West Bengal, India. The study was carried out over a period of one year from March 2025 to March 2026. The study population comprised all Accredited Social Health Activists working under the service area of the Rural Health Unit and Training Centre, Singur. According to available records, there were a total of 97 ASHA workers in the study area. ASHA workers who had been working in the Rural Health Unit and Training Centre, Singur for at least six months were included in the study. Those who did not provide informed consent and those who did not attend the intervention sessions were excluded from the study.

The sample size for the study was calculated using the standard formula for comparison of means. A 95 percent level of significance and 80 percent power of the study were considered. The standard deviation of knowledge scores regarding autism was taken as 3.19 based on a previous study,[14] and the expected difference in mean knowledge scores before and after the intervention was considered to be 1.23 based on earlier evidence.[17] Using these parameters, the calculated sample size was 53. After accounting for a 10 percent non response or attrition rate, the final sample size was increased to 58. A simple random sampling technique without replacement was employed to select 58 ASHA workers from the official list of 97 workers. However, in order to prevent any form of exclusion or discrimination, the health education intervention on autism was delivered to all 97 ASHA workers in the study area. For the purpose of analysis of the before and after intervention outcomes, only the selected 58 participants were considered.

The primary outcome variable of the study was knowledge regarding autism, which was assessed using the Knowledge about Childhood Autism among Health Workers questionnaire.[18] Independent variables included age in completed years, religion categorized as Hindu, Muslim, Christian or others, caste categorized as General, Other Backward Classes, Scheduled Caste and Scheduled Tribe, socioeconomic status, educational status categorized as illiterate, primary, middle, secondary, higher secondary and graduate, marital status categorized as married, widowed or separated, family type categorized as nuclear or joint, years of experience as an ASHA worker, and prior exposure related to autism including whether the participant had ever heard about autism, received any autism related training, or handled a suspected or confirmed autism case.

Data was collected using a pretested and predesigned structured self-administered questionnaire comprising sections on sociodemographic characteristics and knowledge regarding autism. Knowledge was assessed using the Knowledge about Childhood Autism among Health Workers questionnaire (KCAHW), which consists of nineteen items, each with three response options and only one correct answer. Each correct response was awarded a score of one, while incorrect responses were scored zero, yielding a total possible score ranging from 0 to 19. The mean score represented the overall level of knowledge in the study population.[18] Domain-wise and overall knowledge were further expressed as the number of participants providing correct responses for individual items and corresponding total domain scores.

Baseline data collected during the pre-intervention phase were analysed to identify gaps in knowledge regarding autism among the participants. Based on these identified gaps, health education materials were developed. The content was prepared in the local language to ensure better comprehension and was validated by experts from the All-India Institute of Hygiene and Public Health. The materials included PowerPoint presentations, posters, flip charts and leaflets focusing on early signs and symptoms of autism, importance of early identification, and need for timely referral. These materials were pretested among a small group of participants, and necessary modifications were made prior to final implementation.

The study was conducted in multiple phases. During the pre-intervention phase, participants

were recruited from the ASHA workers list. The purpose and nature of the study were explained to them, and written informed consent was obtained. Each participant was assigned a unique identification code to maintain confidentiality. Baseline data were collected using the structured questionnaire to record background information and assess baseline knowledge regarding autism. Following this, the baseline data were analysed to identify specific gaps in knowledge, which guided the development of the intervention. The intervention phase involved delivery of structured health education sessions to the participants. The sessions were conducted at the Rural Health Unit and Training Centre, Singur, using lecture discussion and interactive methods. Various teaching aids including posters, flip charts, PowerPoint presentations and leaflets were used to enhance understanding. Confidentiality and privacy of participants were ensured throughout the process. Post intervention assessment of knowledge regarding autism was carried out using the same questionnaire at two time points. The first assessment was conducted immediately after the intervention to evaluate immediate gain in knowledge. The second assessment was conducted three months after the intervention to assess retention of knowledge over time.

Data were entered and analysed using Microsoft Excel and JAMOVI version 2.6.44. Descriptive statistics were used to summarize sociodemographic characteristics and presented as frequencies, percentages, means with standard deviations, medians with interquartile ranges, and ranges, as appropriate. Domain-wise and overall knowledge scores were computed based on responses to the Knowledge about Childhood Autism among Health Workers questionnaire. Normality of the knowledge score distribution was assessed using the Shapiro–Wilk test, which indicated non-normal distribution ($p<0.001$). Accordingly, non-parametric tests were employed for inferential analysis. The Friedman test was used to compare knowledge scores across the three time points, namely pre-intervention, immediate post-intervention, and three-month follow-up. Post hoc pairwise comparisons were performed using the Durbin–Conover test to identify differences between specific time points. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 58 ASHA workers participated in the study. More than half of the participants belonged to the age group of 41–50 years (53.4%), followed by 31–40 years (22.4%), while only 10.3% were aged ≤30 years. The mean age of the participants was 43±8.15 years, with a median (IQR) of 46 (12.8) years and a range of 25–54 years. The majority of participants were Hindu (94.8%), with a small proportion belonging to the Muslim community (5.2%). In terms of caste distribution, 62.0% were from the unreserved category, followed by scheduled caste (20.7%), other backward class (10.3%), and scheduled tribe (6.9%). Most participants belonged to Class IV socioeconomic status (62.0%) as per the updated BG Prasad scale, followed by Class III (18.9%), Class V (10.3%), and Class II (8.6%). Regarding educational attainment, 43.1% of the ASHA workers were graduates, 34.5% had completed higher secondary education, and 22.4% had secondary level education. A majority had more than 10 years of work experience (63.8%), with a mean work experience of 11.1±6.9 years and a median (IQR) of 13 (9.7) years, ranging from 1 to 28 years. Most of the participants were married (91.4%), while 8.6% were widowed. The predominant family type was nuclear (69.0%), with the remaining 31.0% belonging to joint families. The median per capita income of the participants was 2115 (IQR 1333) (Table 1). Domain-wise assessment of knowledge regarding autism revealed low baseline awareness across all domains among ASHA workers. At baseline, the highest proportion of correct responses was observed in the communication domain, where 17.2% of participants correctly identified delay or lack of spoken language as a feature of autism. In contrast, knowledge related to social interaction and restricted and repetitive behaviors was markedly low, with total scores of 9.1% in both domains. The lowest level of knowledge was observed in the etiology and comorbidity domain, with only 4.3% of correct responses. Following the educational intervention, there was a substantial improvement in knowledge across all domains. In the social interaction domain, correct responses increased markedly across all items,

with the total score rising from 9.1% at baseline to 79.1% immediately after the intervention, and remaining relatively high at 71.1% at three months. Similarly, in the communication domain, correct responses increased from 17.2% at baseline to 89.7% immediately post intervention, with sustained retention at 84.5% after three months. In the domain of restricted and repetitive behaviors, the total score improved from 9.1% at baseline to 73.7% immediately after the intervention, followed by a slight decline to 65.9% at three months. Knowledge regarding etiology and comorbidity also showed notable improvement, increasing from 4.3% at baseline to 72.1% immediately post intervention, with retention at 63.8% during follow up (Table 2). Comparison of knowledge scores across the three time points demonstrated a substantial improvement following the educational intervention. At baseline, the mean knowledge score was very low (0.79±1.94), with a median (IQR) of 0 (0–0), indicating poor baseline awareness among ASHA workers. Immediately after the intervention, the mean score increased markedly to 8.17±2.69, with a median (IQR) of 8 (6–10), reflecting a significant gain in knowledge. At three-month follow-up, although there was a decline in scores i.e., mean 5.83±2.86, with a median of 5 (4–7); the levels remained considerably higher than baseline, suggesting retention of knowledge over time. The Shapiro–Wilk test indicated that the data were not normally distributed ($p<0.001$), justifying the use of non-parametric methods. The Friedman test revealed a statistically significant difference in knowledge scores across the three time points ($\chi^2=112$, $df=2$, $p<0.001$). These findings indicate that the educational intervention had a strong immediate effect on improving knowledge, with a sustained, though partially attenuated, effect at three months (Table 3). Post-hoc pairwise comparisons using Durbin–Conover test showed statistically significant differences between all three time points. Knowledge scores increased significantly from pre-intervention to immediate post-intervention ($p<0.001$) and remained significantly higher at three-month follow-up compared to baseline ($p<0.001$). However, a significant decline was observed between immediate post-intervention and three-month follow-up scores ($p<0.001$), indicating partial loss of knowledge over time (Table 4).

Table 1: Distribution of ASHA workers according to their socio-demographic characteristics (N=58)

Variables	Frequency (Percentage)
Age group (years)	
≤30	6 (10.3)
31–40	13 (22.4)
41–50	31 (53.4)
>50	8 (13.8)
Religion	
Hindu	55 (94.8)
Muslim	3 (5.2)
Caste	
Unreserved (UR)	36 (62.0)
Other Backward Class (OBC)	6 (10.3)
Scheduled Caste (SC)	12 (20.7)
Scheduled Tribe (ST)	4 (6.9)
Socio-economic status	
Class II (Upper middle)	5 (8.6)
Class III (Middle)	11 (18.9)
Class IV (Lower middle)	36 (62.0)
Class V (Lower)	6 (10.3)
Education	
Secondary	13 (22.4)
Higher Secondary	20 (34.5)
Graduate	25 (43.1)
Work experience (years)	
≤10	21 (36.2)
>10	37 (63.8)
Marital status	
Married	53 (91.4)
Widowed	5 (8.6)
Family type	
Nuclear	40 (69.0)
Joint	18 (31.0)

Table 2: Distribution of correct responses across different domains of autism knowledge among ASHAs at pre- and post-intervention time points (N=58)

Domain	Question (Short Description)	Number of participants with correct responses (score = 1)		
		Pre	Post (Immediate)	Post (3 Months)
Domain 1: Social Interaction	Impaired eye contact & non-verbal behaviour	8	50	46
	Failure to develop peer relationships	6	48	44
	Lack of sharing enjoyment/interests	5	47	42
	Lack of social/emotional reciprocity	4	46	41
	Staring into open space	3	40	35
	Appears deaf or dumb	7	49	45
	Loss of interest in surroundings	5	44	39
	Absence of social smile	4	43	38
	Total score	42 (9.1)	367 (79.1)	330 (71.1)
Domain 2: Communication	Delay/lack of spoken language	10 (17.2)	52 (89.7)	49 (84.5)
Domain 3: Restricted & Repetitive Behavior	Stereotyped repetitive movements	6	45	41
	Abnormal eating habits	5	42	38
	Preoccupation with parts of objects	4	40	35
	Love for routine activities	6	44	39
	Total score	21 (9.1)	171 (73.7)	153 (65.9)
Domain 4: Etiology & Comorbidity	Autism = Childhood schizophrenia	2	38	34
	Autism is autoimmune condition	1	36	30
	Autism is neurodevelopmental disorder	3	50	47
	Associated with intellectual disability	4	45	41
	Associated with epilepsy	2	39	33
	Onset usually in infancy	3	43	37
	Total score	15 (4.3)	251 (72.1)	222 (63.8)

Table 3: Comparison of knowledge scores among ASHAs across pre-intervention, immediate post-intervention, and 3-month follow-up (N=58)

Time Point	Mean±SD	Median (IQR)	Range	Test Statistics
Pre-intervention	0.79±1.94	0 (0–0)	0–10	
Post-intervention (Immediate)	8.17±2.69	8 (6–10)	4–17	χ^2=112 df=2 p<0.001
Post-intervention (3- month follow-up)	5.83±2.86	5 (4–7)	2–16	

Table 4: Pairwise comparison of autism knowledge scores among ASHAs (N=58)

Pairwise Comparison	p-value
Pre- vs. immediate post-intervention	<0.001
Pre vs. 3-month post-intervention	<0.001
Immediate post vs. 3-month post-intervention	<0.001

DISCUSSION

Autism Spectrum Disorder (ASD) is increasingly recognized as an important public health concern globally and in India. However, research evidence from low- and middle-income countries remains limited, contributing to delayed diagnosis and under-recognition of autism, particularly in rural settings. Limited infrastructure, lack of trained personnel, and operational challenges in research further widen this gap.[1,4]

In the present study, more than half of the ASHA workers (53.4%) belonged to the 41–50 years age group, while 63.8% had more than 10 years of work experience. Additionally, most participants were graduates (43.1%), and a large proportion belonged to lower-middle socioeconomic class (62.0%). These findings indicate that the majority of ASHA workers were experienced frontline health workers who regularly interact with mothers and children in the community, highlighting their potential role in early identification of developmental disorders.

The present study demonstrated very low baseline knowledge regarding autism among ASHA workers. The mean knowledge score before intervention was 0.79±1.94, with a median score of 0, indicating minimal awareness prior to the educational intervention. Domain-wise analysis further revealed poor baseline knowledge across all domains. In the social interaction domain, only 9.1% of responses were correct, while knowledge regarding restricted and repetitive behaviour was also 9.1%, and the aetiology and comorbidity domain showed the lowest correct response rate of 4.3%. Slightly better awareness was observed in the communication domain (17.2%). A study done by Govindan & Ramu in Karnataka, India among nurses showed knowledge about childhood autism among the study subjects to be 11.42±3.19.[14] Another study done by Ellias et al. reported that a mean knowledge score of 11.85±3.15 out of 19, indicating limited knowledge regarding childhood autism among 201 final-year medical students in seven medical colleges in Mumbai using the KCAHW questionnaire.[19]

Following the educational intervention, a substantial improvement in knowledge was observed across all domains. The mean knowledge score increased to 8.17±2.69 immediately after intervention, with the median score rising from 0 to 8. Domain-wise analysis showed marked improvement: 79.1% correct responses in the social interaction domain, 89.7% in the communication domain, 73.7% in the restricted and repetitive behaviour domain, and 72.1% in the aetiology and comorbidity domain. These findings indicate that the structured educational intervention was effective in improving knowledge among ASHA workers. At the three-month follow-up, a slight decline in knowledge scores was observed, although the levels remained considerably higher than baseline. The mean knowledge score was 5.83±2.86, with a median score of 5. Domain-wise correct responses remained relatively high, with 71.1% in the social interaction domain, 84.5% in the communication domain, 65.9% in restricted and repetitive behaviour, and 63.8% in the aetiology and comorbidity domain. This suggests that while some knowledge attrition occurred over time, the intervention had a sustained positive effect.

Our study findings are consistent with previous studies which have shown that training programs and educational interventions significantly improve knowledge regarding autism among healthcare providers and primary care workers.[16,17] A study done by Hagag et al. in Egypt showed statistically significant improvement in the post-intervention knowledge score as compared to the pre intervention knowledge score for each of the four domains of the modified KCAHW questionnaire ($p<0.001$).[16] Another study done by Bordini et al. reported that ASD knowledge among primary care providers significantly improved after training, with mean scores increasing from 6.73 to 9.18 ($p<0.01$). Additionally, four months after training, referrals of suspected ASD cases to specialized mental health services increased sixfold.[17]

Early identification of autism is critical because early psychosocial and behavioural interventions can significantly improve communication skills, social interaction, and adaptive functioning in affected children[15]. International guidelines also recommend routine developmental surveillance and screening during early childhood to facilitate early diagnosis.[13] Moreover, the importance of strengthening knowledge among frontline healthcare providers becomes particularly relevant in India, where autism prevalence is estimated to be approximately 1 in 65 children aged 2–9 years.[2] Despite this significant burden, developmental screening for autism is not

routinely integrated into many primary healthcare services.[12] Since ASHA workers serve as the primary link between the healthcare system and the community, enhancing their knowledge regarding autism could play a vital role in early identification, referral, and timely intervention. Overall, the findings of this study demonstrate that structured educational interventions can significantly improve knowledge regarding autism among ASHA workers, and such capacity-building initiatives may contribute to improved early detection and better outcomes for children with autism in rural communities.

The present study has several strengths. A standardized and validated tool, the KCAHW questionnaire, was used to assess knowledge regarding autism, ensuring methodological rigor and comparability with existing literature. Knowledge assessment was carried out at three time points, namely baseline, immediate post intervention, and three month follow up, which enabled evaluation of both immediate impact and retention over time. The educational intervention was context specific and delivered in the local language, which likely enhanced comprehension and engagement among participants. Furthermore, the study specifically focused on ASHA workers, who are key frontline health workers in rural India and play a crucial role in delivering maternal and child health services, thereby increasing the practical relevance of the findings. However, certain limitations should be considered while interpreting the results. The study employed a quasi-experimental design without a control group, which limits the ability to attribute the observed changes exclusively to the intervention. The relatively small sample size and restriction to a single rural field practice area may affect the generalizability of the findings. In addition, knowledge assessment was based on a self-administered questionnaire, which may be subject to response bias. Finally, while the study demonstrated improvement in knowledge, it did not assess whether this translated into changes in actual practices or referral behaviour, which are critical for improving early identification and management of autism.

CONCLUSION

The present study identified a substantial gap in baseline knowledge regarding autism among ASHA workers in a rural field practice area, underscoring a critical limitation in the capacity for early identification of developmental disorders at the community level. A structured, context-specific educational intervention resulted in a significant improvement in knowledge immediately after training, with sustained retention observed at three-month follow-up despite some decline over time. The findings of this study demonstrate that targeted training interventions can effectively enhance autism-related knowledge among frontline health workers. Strengthening the capacity of ASHA workers through structured training and periodic refresher programs may facilitate early recognition of developmental delays and improve referral practices within primary healthcare settings. From a public health and policy perspective, the study provides evidence that capacity-building initiatives at the community level can serve as a foundational step toward strengthening developmental surveillance in rural areas. The observed improvement in knowledge suggests that equipping ASHA workers with appropriate skills may support the incorporation of developmental screening into routine maternal and child health services. Integrating such training within existing health system frameworks could contribute to earlier diagnosis, timely intervention, and improved developmental outcomes for children in resource-constrained settings.

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Author's contribution: All authors were equally involved in study design, participant selection, data collection, compilation and analysis as well as manuscript preparation, editing and final submission.

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