Research Paper

Knowledge of and Attitude to Nuclear Power among Residents around Tianwan Nuclear Power Plant in Jiangsu of China

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Abstract

Aims: The aims of this paper were to determine the level of knowledge of and attitude to nuclear power among residents around Tianwan Nuclear power plant in Jiangsu of China.

Design: A descriptive, cross-sectional design was adopted.

Participants: 1,616 eligible participants who lived around the Tianwan nuclear power plant within a radius of 30km and at least 18 years old were recruited into our study and accepted epidemiological survey.

Methods: Data were collected through self-administered questionnaires consisting of a socio-demographic sheet. Inferential statistics, *t*-test, ANOVA test and multivariate regression analysis were used to compare the differences between each subgroup and correlation analysis was conducted to understand the relationship between different factors and dependent variables.

Results: Our investigation found that the level of awareness and acceptance of nuclear power was generally not high. Respondents' gender, age, marital status, residence, educational level, family income and the distance away from the nuclear power plant are important effect factors to the knowledge of and attitude to nuclear power.

Conclusions: The public concerns about nuclear energy's impact are widespread. The level of awareness and acceptance of nuclear power needs to be improved urgently.

Key words: cross-sectional design, knowledge, attitudes, radiation, nuclear power

Introduction

With the increasing pressure of energy shortage, nuclear power as a high quality clean energy plays an increasingly important role in the worldwide electricity production. According to IAEA report shows that the global nuclear power generation accounts for about 16% in 2002 and is expected to 25% of the total world electricity generation. In China, the country nuclear power generation accounts for only 1.5% in 2002 and is expected to 6% of the total generating capacity [1]. Faced with increasingly strong demand for

energy, accelerating the pace of development of nuclear power has become a global, including China, energy revolution to achieve the new strategic initiatives.

Experience of nuclear power development shows that in addition to technical and economic factors, the public acceptance and attitude to the nuclear power play an important role in the development of nuclear power [2], while the level of public awareness of nuclear power, which called familiarity is an im-

portant impact factor on public acceptance. Barke Rothman et al's study found that with the increased familiarity with nuclear energy, the proportion of people who consider nuclear energy safety was corresponding increased, and the percentage of public, scientists, energy scientists and nuclear experts who believed the nuclear power safety were 40%, 60%, 76% and 99%, respectively [3]. Although western developed countries had conducted a series of nuclear risk perception research from the 1990s, there still lacked systematic research on this area in China. Therefore, there is a pressing need to conduct relevant study to address the identified issue. The purpose of this paper is to report a study on the level of knowledge and attitude of nuclear power among Chinese residents around the Tianwan nuclear power plant within a radius of 30km in Jiangsu of China.

Materials and Methods

Research design

The study adopted a descriptive, cross-sectional design with self-administered questionnaires to assess the level of knowledge and attitude of nuclear power among Chinese residents. It was conducted though surveyed each participants respectively who lived around the Tianwan in Lianyungang of Jiangsu, a representative city of nuclear power plant in China, in December 2010.

Survey subjects

The survey was conducted among local residents who lived around the Tianwan nuclear power plant within a radius of 30km and at least 18 years old. In addition, we divided these people into two groups as follow: a. general public which including town residents and rural residents; b. representative comments which including government officials, engineers, doctors and teachers. It is worth emphasizing that we try to make the proportions of sex and age of our survey subjects consistent with the local population during the subject selecting. Finally, 1,616 eligible participants were recruited into our study and accepted epidemiological survey.

Survey methods

The survey conducted stratified cluster sampling methods, we defined the nuclear power plant as the center and divided the survey area into 6 groups according to the distance that away from the center 0~5, ~10, ~15, ~20, ~25 and ~30km. In each group, we randomly selected 2~3 villages/committees and planned to survey 200 general public and 50 representative comments.

Survey content

The survey content mainly divided into two parts, the first part is the basic situation survey for the individual subject, including age, gender, marital status, residence, education, family income, the distance away from the nuclear power plant and so on; the second part is the survey about the knowledge of and attitude to nuclear power plant. For example, the "Nuclear power knowledge" in second part was about whether considered that nuclear power is an economical, safe and clean energy source, whether thought the nuclear power plant is not safe, whether believed that the nuclear power plant also produce harmful effects while under normal operation, whether thought the nuclear power plant may exploded like the atomic bomb and whether believed the nuclear power plant will produce nuclear leak. The "Nuclear power anxiety" in second part was about whether worried about improper handling of the nuclear waste, whether worried the nuclear power plant would harmful to their body, whether worried problem that the nuclear power plant may arise during the operation, whether worried problem of the nuclear power plant design and construction links, whether worried about the quality of construction and whether felt nervous on the local nuclear power plant construction.

We try to make the survey content comprehensive and concise and all investigators have been accepted the epidemiologists and psychologists training. We unified the investigation standards and selected investigator who had passed the qualified test.

Ethical consideration

Ethical approval was granted by the Survey and Behavioural Research Ethics Committee of the Jiangsu Provincial Center for Disease Prevention and Control, and permission to carry out the study was obtained from the Lianyungang Center for Disease Prevention and Control. Voluntary participants were assured of their information and confidentiality, and they were informed of their right to withdraw from the study at any time. Informed consent was obtained prior to data collection. Contact detail of the researcher was provided on the cover letter for their easy reference.

Procedure

To test the feasibility of the study, a pilot study on 50 community residents who met the inclusion criteria was conducted prior to the main study. Only minor amendments to the format of the questionnaire were made. For all the respondents, some were invited to participate in the survey in their homes, some were in their offices and some were in community.

Potential participants were given prior information about the purpose of the study. Emphasis was made that participation to the study was entirely voluntary. Self-administered survey requires respondents to perceive and comprehend the information and the layout before they provide correct data [4]. If the respondent in this study was not experienced in completing questionnaires, a 'classroom model' of implementing the survey was adopted [5] to facilitate the completion of the survey questionnaire. The researcher read out the questions one by one aloud and allowed adequate pauses between each question for the participants to independently respond in writing. Emphasis was made about the importance and maintenance of confidentiality with responses to the survey questions, and participants were further instructed not to exchange opinion while answering the questionnaire. Participants spent around 15–20 minutes to complete the questionnaires. Assistance was provided to a few participants with limited literacy. On return of the completed questionnaire to the researcher, each participant received a complimentary souvenir.

Statistical analysis

Data collected were entered by duplicate entry and passed the consistency test by Epidata 3.02. The descriptive and inferential data analysis was undertaken using SPSS 17.0 (Statistical Package for the Social Sciences Version 17.0, SPSS Inc., Chicago, Illinois, U.S.A.). Descriptive statistics, means and standard deviations, were used to summarize the demographic data. Inferential statistics, *t*-test and ANOVA test were used to compare the differences between each subgroup and correlation analysis was conducted to understand the relationship between different factors and dependent variables. We further perform multivariate regression analysis in stratified analysis, in order to identify the factors which are independently associated with the knowledge about nuclear power plant. All tests were two-tailed and the *P* values were set at < 0.05.

Results

Demographic characteristics

A total of 1,616 eligible participants were recruited into our study and accepted epidemiological survey. The demographic characteristics of these participants in the study are provided in Table 1. As shown in the table, of the 1,616 respondents, 778 (48.1%) were men and 838 (51.9%) were women, the age of participants ranged from 18–85 years with a mean age of 43.4 (SD: 14.7) and the proportions of sex

and age-group were almost consist with the local population. The proportion of town and rural residents were 65.1% and 34.9% respectively and 85.6% subjects were married. The education level of respondents was relatively high (36.6% participants were received primary education, 31.5% were received high school education and 14.7% were received university or above education). 25.0% subjects' family income were low than ten thousand Yuan, while 22.7% were more than forty thousand Yuan. In addition, after stratified by the distance away from the plant, the respondents' proportion of each subgroup was met the design requirement of the beginning.

Radiation awareness

The survey found that the public awareness on radiation is not high, the results shown that 59.0% respondents did not quite understand the conception of radiation, of which 18.4% people fully did not understand it; 57.2% respondents said they did not recognize the sign of radioactive; Although 59.6% people considered natural radiation present in our environment, there were still 31.4% people did not know the existence of natural radiation; In addition, 58.4% people did not know the conception of half-life of radioactive materials. However, the survey on the relationship between radiation and human health shown that 93.0% respondents believed the radiation is harmful to human health.

We further conducted stratified analysis to estimate the level of knowledge of radiation in different characteristics people around the plant by investigating respondents whether understood the conception of radiation. The options of answer were divided into five levels: No idea, Do not quite understand, Understand some, Understand more and Very familiar, which corresponding scored 1, 2, 3, 4, 5 point. Respondents were required to selecting one answer out of five options and the higher mean score indicating the higher level of understand. As shown in Table 2, men's mean score was slightly higher than women's (*p*<0.001); the town residents' mean score was also higher than rural residents' (*p*<0.001). In addition, for different age groups, marital status, educational level, family income and distance away from the plant, the mean score was also different, respectively. We further used the correlation analysis to understand the relationship between different groups and different scores. In our results, we can find that there is a negative correlation between age and the level of understanding (*r*=-0.12, *p*<0.001), but with the improvement in educational level and family income, the level of knowledge of radiation is corresponding increase (*r*=0.43, *p*<0.001 and *r*=0.18, *p*<0.001, respectively).

However, we failed to find any significant correlation between different marital status or distance away from the plant and the level of knowledge of radiation (see Table 2).

Table 1. Sample demographic characteristics (N=1616)

Variables	Group	N	%	Min	Max	Mean	SD
Gender	male	778	48.1				
	female	838	51.9				
Age (year)	male	777	48.1	18	84	44.2	15.1
	female	837	51.9	18	85	42.6	14.2
	18-29	328	20.3	18	29	24.7	3.1
	30-39	390	24.2	30	39	34.6	2.9
	40-49	356	22.1	40	49	44.2	3.0
	50-59	293	18.2	50	59	54.7	2.8
	≥60	247	15.3	60	85	67.4	6.3
	total	1614	100.0	18	85	43.4	14.7
Residence	town	1052	65.1				
	rural	563	34.9				
Marital status	married	1381	85.6				
	divorced	18	1.1				
	widowed	46	2.9				
	single	169	10.5				
Educational level	illiteracy	133	8.3				
	elementary school	143	8.9				
	primary school	590	36.6				
	high school	507	31.5				
	university or above	237	14.7				
Family income (Kilo Yuan)	<1	303	18.8				
	1~	403	25.0				
	2~	541	33.6				
	4~	277	17.2				
	8~	69	4.3				
	15~	19	1.2				
Distance away from the plant (km)	~5	287	17.8				
	~10	315	19.5				
	~15	229	14.2				
	~20	274	17.0				
	~25	277	17.1				
	~30	234	14.5				

Nuclear power knowledge

In the survey, only 42.8% participants considered that nuclear power is an economical, safe and clean energy source; 33.0% people thought the nuclear power plant is not safe and 36.7% people believed that the nuclear power plant also produce harmful effects while under normal operation; 39.7% people thought

the nuclear power plant may exploded like the atomic bomb and 30.7% people believed the nuclear power plant will produce nuclear leak.

Table 2. The level of knowledge of radiation

	Mean score	F/t	p	r (p)
Gender		4.82	0.00	-0.12 (p<0.001)
male	2.49			
female	2.27			
Age		46.34	0.00	-0.30 (p<0.001)
18-29	2.61			
30-39	2.63			
40-49	2.52			
50-59	2.08			
≥60	1.81			
Residence		7.38	0.00	-0.19 (p<0.001)
town	2.50			
rural	2.14			
Marital status		14.05	0.00	0.04 (p=0.09)
married	2.36			
divorced	2.50			
widowed	1.65			
single	2.66			
Educational level		100.48	0.00	0.43 (p<0.001)
illiteracy	1.41			
elementary school	1.71			
primary school	2.32			
high school	2.63			
university or above	2.95			
Family income (Kilo Yuan)		18.89	0.00	0.18 (p<0.001)
<1	2.08			
1~	2.31			
2~	2.43			
4~	2.61			
Distance away from the plant (km)		8.06	0.00	-0.02 (0.50)
~5	2.29			
~10	2.45			
~15	2.45			
~20	2.31			
~25	2.60			
~30	2.11			

We also conducted stratified analysis to estimate the level of knowledge of nuclear power in different characteristics people around the plant by investigating respondents whether considered the nuclear

power is an economical, safe and clean energy source. Respondents were required to respond to this question by selecting one answer out of three options namely "Do not know", "No" or "Yes" and corresponding scored 1, 2, 3 point and the higher mean score indicating the higher degree of understand. As shown in Table 3, men and town residents' mean score were higher than women and rural residents' ($p<0.001$ and $p<0.001$). For different age groups, educational level and family income, the mean score was also different, respectively. But we failed to find any significant difference of score in marital status group and distance group. We further used the correlation analysis to understand the relationship between different groups and different scores and we only found a positive correlation between the educational level and the level of knowledge of nuclear power ($r=0.18$, $p<0.001$) (see Table 3).

Nuclear power anxiety

In order to know the anxiety of the nearby residents on the nuclear power plant, we conducted a survey on related issues. The results shown that most of respondents (83.5%) worried about improper handling of the nuclear waste; 81.0% people worried the nuclear power plant would harmful to their body. When asked about the most worried problem that the nuclear power plant may arise during the operation, most (36.4%) respondents were worried about nuclear leaks. When asked about the most worried problem of the nuclear power plant design and construction links, most (29.3%) respondents were worried about the quality of construction. 75.8% subjects felt nervous on the local nuclear power plant construction, even 39.0% people have considered migration, while 29.1% people have existed different degrees of insomnia symptoms for this matter.

In stratified analysis, we estimated the level of anxiety in different characteristics people around the plant by investigating respondents whether worried the nuclear power plant would harmful to their body. Respondents were required to respond to this question by selecting one answer out of three options namely "Never", "Sometimes" or "Often" and corresponding scored 1, 2, 3 point and the higher mean score indicating the higher level of anxiety. As shown in Table 4, women's mean score were higher than men's ($p<0.001$), but there was no significant difference between town and rural residences. For different age groups, educational level and distance, the mean score was also different, respectively. But we failed to find any significant difference of score in family income group. We further used the correlation analysis to understand the relationship between different

groups and different scores. The results shown that there was a positive correlation between the educational level and the level of anxiety ($r=0.13$, $p<0.001$), and a negative relationship between distance away from the plant and the level of anxiety of nuclear power ($r=-0.20$, $p<0.001$) (see Table 5).

Table 3. The level of knowledge of nuclear power

	Mean score	F/t	*p*	*r (p)*
Gender		7.71	0.00	-0.19 (*p*<0.001)
male	2.28			
female	1.95			
Age		3.81	0.00	-0.01 (p=0.67)
18-29	2.02			
30-39	2.20			
40-49	2.18			
50-59	2.07			
≥60	2.00			
Residence		3.55	0.00	-0.09 (*p*<0.001)
town	2.16			
rural	2.00			
Marital status		1.28	0.28	-0.02 (p=0.39)
married	2.11			
divorced	2.39			
widowed	1.96			
single	2.07			
Educational level		8.43	0.00	0.18 (*p*<0.001)
illiteracy	1.80			
elementary school	1.81			
primary school	2.07			
high school	2.20			
university or above	2.35			
Family income (Kilo Yuan)		13.23	0.00	
<1	1.93			
1~	1.99			
2~	2.17			
4~	2.29			
Distance away from the plant (km)		1.87	0.10	0.05 (p=0.06)
~5	2.03			
~10	2.15			
~15	2.05			
~20	2.05			
~25	2.16			
~30	2.21			

Table 4. The level of anxiety of nuclear power plant

	Mean score	F/t	*p*	*r (p)*
Gender		3.50	0.00	0.09 (*p<0.001*)
male	2.00			
female	2.12			
Age		6.80	0.00	-0.10 (*p<0.001*)
18-29	2.09			
30-39	2.15			
40-49	2.05			
50-59	2.08			
≥60	1.88			
Residence		1.39	0.17	-0.04 (p=0.15)
town	2.08			
rural	2.03			
Marital status		4.91	0.00	-0.04 (p=0.09)
married	2.07			
divorced	2.11			
widowed	1.70			
single	2.05			
Educational level		8.23	0.00	0.13 (*p<0.001*)
illiteracy	1.85			
elementary school	1.99			
primary school	2.02			
high school	2.11			
university or above	2.21			
Family income (Kilo Yuan)		0.83	0.48	0.04 (p=0.13)
<1	2.02			
1~	2.05			
2~	2.06			
4~	2.10			
Distance away from the plant (km)		13.51	0.00	-0.20 (*p<0.001*)
~5	2.28			
~10	2.14			
~15	2.06			
~20	2.00			
~25	1.97			
~30	1.86			

Table 5. The attitude to nuclear power plant

	Mean score	F/t	*p*	*r (p)*
Gender		5.72	0.00	-0.14 (*p<0.001*)
male	3.00			
female	2.67			
Age		1.85	0.12	-0.03 (p=0.31)
18-29	2.77			
30-39	2.96			
40-49	2.84			
50-59	2.79			
≥60	2.75			
Residence		5.52	0.00	-0.14 (*p<0.001*)
town	2.95			
rural	2.61			
Marital status		2.72	0.04	-0.01 (p=0.84)
married	2.83			
divorced	3.33			
widowed	2.46			
single	2.86			
Educational level		15.92	0.00	0.19 (*p<0.001*)
illiteracy	2.38			
elementary school	2.49			
primary school	2.75			
high school	3.00			
university or above	3.14			
Family income (Kilo Yuan)		17.23	0.00	0.17 (*p<0.001*)
<1	2.51			
1~	2.67			
2~	2.96			
4~	3.06			
Distance away from the plant (km)		1.95	0.08	0.02 (p=0.55)
~5	2.72			
~10	2.94			
~15	2.89			
~20	2.70			
~25	2.87			
~30	2.88			

Nuclear power attitude

For the application, development and prospects of nuclear power plant, only 40.3% respondents believed nuclear power plant would more good than harm. Although 34.7% subjects supported China's great efforts to develop nuclear power plants, 54.7% people opposed building nuclear power plants in local region. It is worth noting that 70.8% respondents supported the development of new energy sources such as solar energy.

Our survey also found that 69.3% respondents felt the relevant information and publicity about the nuclear power plant they can obtain was very little,

while 88.0% people said they usually not easy to obtain relevant knowledge, even 25.5% people unable to get it. Further investigation revealed that 81.8% respondents very desired to obtain more relevant knowledge of nuclear power. When asked which way they most hoped to obtain the relevant knowledge, 36.2% people choose the TV, 23.7% people hope to send publicity materials door to door and 11.1% people choose the Internet information. For related argument about nuclear power, over half of the respondents claimed they will believe the nuclear safety experts' explanation.

Facing the assumption nuclear accidents crisis, 55.6% respondents will choose to stay home and wait for government's rescue, but there were still 32.7% people will choose to leave home immediately and escape to the direction far away from the nuclear power plant. Further investigation found that 23.2% respondents hoped related departments to strengthen relevant science propaganda; 23.0% people wished to improve government and public's prevention and emergency response capabilities and 19.2% people expected government to strengthen the supervision and management of nuclear power plant, which accounted for the top three optional measures.

In stratified analysis, we estimated the attitude to nuclear power plant by investigating respondents how to look at the relationship between risks and benefits of nuclear power plant more good than harm. Respondents were required to respond to this question by selecting one answer out of four options namely "Do not know", "More harm than good", "Equivalent" or "More good than harm" and corresponding scored 1, 2, 3, 4 point and the higher mean score indicating the higher positive attitude to nuclear power plant. As shown in Table 5, men and town residents' mean score were higher than women and rural residents' ($p<0.001$ and $p<0.001$). For different marital status, educational level and family income, the mean score was also different, respectively. But we failed to find any significant difference of score in age and distance group. In further correlation analysis, both educational level and family income were shown the positive correlation with the attitude to nuclear power plant ($r=0.19$, $p<0.001$ and $r=0.17$, $p<0.001$, respectively) (see Table 5).

In addition, we conducted stratified analysis to estimate the demands of publicity about the nuclear power plant by investigating respondents whether desired to obtain more relevant knowledge of nuclear power. The options of answer were divided into three levels: Do not hope, Does not matter and Desire, which corresponding scored 1, 2, 3 point. Respondents were required to selecting one answer out of

three options and the higher mean score indicating the higher degree of demands. As shown in Table 6, men and town residents' mean score was slightly higher than women and rural residents' ($p<0.001$ and $p<0.001$).

Table 6. The demands of publicity about nuclear power plant

	Mean score	F/t	p	r (p)
Gender		2.85	0.00	-0.07 (*p*<0.001)
male	2.73			
female	2.63			
Age		5.03	0.00	-0.06 (p=0.01)
18-29	2.65			
30-39	2.77			
40-49	2.72			
50-59	2.66			
≥60	2.53			
Residence		3.56	0.00	-0.09 (*p*<0.001)
town	2.72			
rural	2.59			
Marital status		2.20	0.09	-0.06 (p=0.23)
married	2.70			
divorced	2.72			
widowed	2.50			
single	2.59			
Educational level		10.92	0.00	0.16 (*p*<0.001)
illiteracy	2.41			
elementary school	2.49			
primary school	2.67			
high school	2.75			
university or above	2.81			
Family income (Kilo Yuan)		9.34	0.00	0.12 (*p*<0.001)
<1	2.50			
1~	2.66			
2~	2.74			
4~	2.75			
Distance away from the plant (km)		2.43	0.03	-0.03 (p=0.18)
~5	2.71			
~10	2.75			
~15	2.67			
~20	2.56			
~25	2.69			
~30	2.69			

For different age groups, educational level, family income and distance away from the plant, the mean score was also different, respectively. Further correlation analysis revealed positive relationships between the educational level and the demands of publicity ($r=0.16$, $p<0.001$) and the family income and demands of publicity ($r=0.12$, $p<0.001$), respectively. In addition, we also found a slightly negative relationship between age group and the demands of publicity about the nuclear power plant ($r=-0.06$, $p=0.01$) (see Table 6).

Discussion

The Tianwan nuclear power plant was put into operation in May 2007 and played an active and important role in economic and social development. With the continuous economic and social development, the level of awareness and acceptance of the danger of nuclear and radiation in public, especially residents near the region of nuclear power plant, will play an increasingly important role in the construction of its nuclear facilities. To estimate the level of knowledge and attitude to nuclear power, our systematic investigation was conducted among local residents who lived around the Tianwan nuclear power plant within a radius of 30km and at least 18 years old from the radiation awareness, nuclear power knowledge, nuclear power anxiety and nuclear power attitude aspects. We further conducted stratified analysis by gender, age, residence, marital status, educational level, family income and distance away from the plant.

Our investigation has shown that the level of knowledge of nuclear power was generally not high. Integrated the findings of radiation awareness and nuclear power knowledge, we can draw that the public understanding of radiation and nuclear power was obviously insufficient while this lack of understanding existed difference among different characteristics people. As shown in our findings, men, younger people, town residents, higher educational level people and higher family income people' awareness were significantly higher than women, older people, rural residents, lower educational level people and lower family income people', which revealed that gender, age, residence, educational level and family income are important effect factors to the knowledge of nuclear power. It's worth pointing that we failed to find significant difference of nuclear power knowledge among different distances people, though we found difference of radiation awareness among those people. Further correlation analysis did not find significant relationship between distances and the level of knowledge of nuclear power, which verified that dis-

tances might not affect the public awareness of nuclear power, the overall cognitive level actually lower, which urgent needed to strengthen.

Throughout the investigation process, we can feel majority of respondents showed some degree concerns of nuclear power. The finally study results confirmed this phenomenon. Over 80% people worried about improper handling of the nuclear waste and the harmful to their body, though the degree of anxiety showed difference in different gender, age, marital status, educational level and distances group. Further correlation analysis obviously shown that with the improvement of educational level and the farther away of distance, the degree of anxiety occurred decreased trend. It was interesting to emphasize that we failed to find any significant difference of anxiety degree in different residence and family income people, which suggested the prevalence of anxiety from another aspects.

For the attitude to nuclear power, 40.3% respondents believed nuclear power plant would more good than harm, only 34.7% subjects supported China's great efforts to develop nuclear power plants, but over 50% people opposed building nuclear power plants in local region. It is worth noting that our survey has found that over 70% respondents supported the development of new energy sources such as solar energy, which proving again that the public sensitivity of potential dangers of radiation was much higher than other environmental pollutants [6]. These results suggested the public acceptance of nuclear power is still not high. Further analysis found that the level of acceptance showed higher in men, town residents, higher educational level people and higher family income people than women, rural residents, lower educational level people and family income people. Women had been reported more negative attitudes on nuclear power [7], which consistent with our results. However, the difference did not be found among different age and distances group, which warned that we could not ignore the popularization of different ages and long-range population.

To further understand the needs of publicity about the nuclear power, we conducted related survey and revealed that over 80% respondents very desired to obtain more relevant knowledge of nuclear power, which further validated our previous inference. Further analysis found that the needs of publicity showed higher in men, younger people, town residents, higher educational level people and higher family income people. Unexpectedly, with the improvement of educational level and the family income, the needs of publicity gradually increased. However, the difference also did not be found in dif-

ferent distances group, which suggested the distance away from the nuclear power plant could not affect the demands for relevant knowledge of nuclear power.

In summary, although nuclear energy is an economical, safe and clean energy source, the public concerns about its impact are widespread. When alternative energy sources appear, most people choose to develop others rather than nuclear power. China's nuclear power development is still in the initial stage, whether can be vigorous developed will ultimately depend on public acceptance. Public, particularly residents who lived around the nuclear facilities have a huge influence on its development. Their knowledge of and attitude to nuclear power will plays an increasingly important role in the construction of nuclear power plants. Now, low-dose radiation risks and the safety of nuclear power plants have already become worldwide social and political issues. Therefore, increasing the popularization of knowledge of nuclear power and radiation, raising public awareness of nuclear emergency, listen to the different reflection of public, carrying out health education to residents around nuclear power facilities and establishing improved disease surveillance system are particularly important. In addition, we should regularly invite residents to visit the nuclear facilities on-site operation and construction, regularly publish credible information on environmental radiation monitoring and health surveillance data, and thus to dispel the public's worries and concerns, which make them have comprehensive rational understanding of nuclear energy, support rather than blind obedience, active rather than passive support the development of nuclear power industry.

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Competing Interests

The authors have declared that no competing interest exists.

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