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Factors associated with cyberbullying among vocational students based on the ecological system model in an ethnic minority area

Li Zhou, MD[a], Chunyu Li, PhD[b,*]

Abstract

This study aimed to investigate the current situation of youth cyberbullying (CB) in an ethnic minority area in China and the socio-ecological factors influencing it to provide a scientific basis for the development of health education and improved decision-making for youth in these areas.

The cluster sampling method was adopted to conduct a questionnaire survey of 2156 students from 2 vocational high schools in Yanbian Korean Autonomous Prefecture in December 2019. SPSS 22.1 statistical software was used for data analysis.

CB among vocational school students in the Yanbian Korean Autonomous Prefecture is relatively common, with 51.62% of the participants reporting having bullied someone and 68.65% reporting having been bullied online. The rate of CB perpetration and victimization among adolescents in minority areas is affected by individuals, family, peer factors, and school climate.

The phenomenon of vocational high school student CB in ethnic minority areas is affected by personal, familial, interpersonal, and school environments. It is recommended that the individual and social-ecological factors in which adolescent CB interventions are formulated in the future be comprehensively considered.

Abbreviations: CB = cyberbullying, CI = confidence interval, CV = cybervictimization, OR = odds ratio, SMS = short message service, YKAP = Yanbian Korean Autonomous Prefecture.

Keywords: cyberbullying, ecological system, minority health, vocational high school students

1. Introduction

Cyberbullying (CB) and cybervictimization (CV) are currently attracting increasing attention in research, contemporary practice, and policy.[1] CB can be defined as the behavior of individuals or groups repeatedly sending hostile or offensive messages through electronic or digital media, with the intention of causing humiliation, suffering, fear, and despair to others.[2,3] When CB occurs, at least 2 people are involved. The cyberaggressor commits the cyberaggression, and the cybervictim receives it, thereby creating CV.[2] Compared with traditional bullying and victimization, CB and CV involve more extreme violation of personal privacy,[4,5] coupled with the perpetrators' ability to harass others without being constrained by the time and place, which may lead to more psychological and behavioral problems for both the perpetrators and victims.[6] Some empirical evidence has established that student involvement in CB, either as a bully or victim, produces a series of short-, medium-, and long-term impacts on their psychological and behavioral health,[7,8] potentially leading to school dropout, low self-esteem, social isolation, and depression and may turn into actual violence and even suicidal tendencies. In these contexts, identifying prevalence and risk factors to inform prevention and intervention strategies is a pertinent task. Furthermore, considering the coronavirus disease 2019 pandemic, cyberspaces have become even more important in daily life than pre-pandemic, so identifying prevalence and risk factors to inform prevention and intervention strategies regarding CB is an even more imperative task.[3]

Reviews of the scientific literature have found that research on CB and CV has been widely conducted in Western settings. Recent studies have shown that the worldwide prevalence of CB ranges from 6.0% to 46.3%, whereas 65% of adolescents have suffered CV at least once in their lifetime.[3] Unlike Western literature, research on CB in China is still in its early stages. Most extant research on CB or CV is focused on adolescents in elementary, middle, high schools, and college. However, the prevalence of CB among Chinese students varies greatly in published studies.[9,10] Previous research has estimated the average rates for high school students in central China areas and suggests that 56.88% of students have been cyberbullied and 38.84% had cyberbullied others.[9] In a review study of adolescents among high schools and junior and elementary schools in 4 selected major Chinese societies, including Taiwan, Hong Kong, Macau, and Mainland China, the incidence of

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[a] School of Medicine, Yanbian University, Yanji, China, [b] School of Nursing, Yanbian University, Yanji, China.

[*] Correspondence: Chunyu Li, School of Nursing, Yanbian University, 977# Gongyuan Road, Yanji, Jilin 133000, China (e-mail: 2542223095@qq.com).

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CB and CV ranged from 3% to 60% and 12% to 72%, respectively.[10] The differences were mostly due to the different populations, locations, and age groups. According to the 44th Statistical Report on Internet Development in China (2019),[11] the number of Chinese Internet users was 854 million, of which 16.9% were aged between 10 and 19. In China, adolescents in this age group mainly include students in elementary school, middle school, high school, vocational high school, and college. In contrast to the abundance of large-scale studies on colleges, high schools, and junior and elementary schools, there have been relatively few attempts to collect data among vocational high schools.[10,12] Understanding CB and CV among this group is an important part of public health, and the present study attempts to help fill this gap.

In China, vocational high school is equivalent to regular high school, and vocational high school students study professional knowledge and skills. After 9 years of compulsory schooling, 55% of students in China choose to continue to high school; approximately 45% of these will choose vocational high school and training that aims to improve their skills for specific vocations.[13] However, classroom content for this type of schooling has been simplified in recent years. As such, vocational high school students have relatively few learning tasks and might have more free time to spend on electronic or digital media.[14] The skills they learn in a vocational school are relatively unique and provide them a professional advantage, but they lack positive motivation and a strong sense of self and have weak teamwork ability, poor self-bearing, and poor self-management abilities.[14,15] Most vocational high school students have poor grades in junior high school. In addition to the differences in the educational setting, vocational high school students also differ from high school students regarding their health behavior. Compared with their peers in high school, students attending vocational schools have a greater risk of developing harmful patterns of addictive behaviors and of becoming involved in bullying and health risk behaviors,[13–15] the nature of which is often more complex due to underlying bio-psycho-social conditions. In addition, in an important period in the formation of their life values and self-development, these students can access information and create interpersonal relationships using digital media, so it is very important to gain insight into the underlying causes of CB and CV, which will contribute to the prevention of CB and CV and promote health and well-being among this particular group of students.[16] However, so far, adolescents who attend vocational high school, at least in China, have remained absent in research regarding CB and CV.

Previous studies have suggested that the bullying phenomena can differ among cultures and geographic locations, which has attracted growing research on the similarities and differences of CB and CV across countries and cultures.[17,18] Mainland China, however, is a large and culturally diverse area, so it is necessary to investigate CB and CV considering its different regions and populations. Yanbian Korean Autonomous Prefecture (YKAP) is located in the southeast region of Jilin Province, China. There is a large, highly mobile population of Chinese-Koreans in this area.[19] YKAP is a diverse and inclusive minority region, where all groups are respected and cared for. However, due to the influence of language and traditional culture, people living here have differences in some cultural structural elements such as customs, cognitive habits, family norms, parenting styles, and gender role expectations. Existing studies have pointed out that culture and background play a vital role in shaping the experience of adolescence, mitigating the risk of youth violence, and related pathological role behaviors. Therefore, it is necessary to detect and screen young people's CB risks in this ethnically integrated area.[20]

CB is a global problem, and there is increasing interest in determining its causes. Students involved in CB and CV are affected by a variety of factors. Research on CB and CV has indicated that these influencing factors include the student's individual characteristics, family environment and family education, school-level supervision and education, social environment, and social network environment.[8,21–24] Prior studies have examined many of these influencing factors individually, but there is scarce research that explores these factors comprehensively. The social ecology system theory explores the setting-related factors in which human behaviors occur and emphasizes the complex interaction between an individual and different structures of the environment.[23] Zastrow and Kirst-Ashman[25] subdivided the ecological system simply into a microsystem, mesosystem, and macrosystem for clarity. A microsystem includes an individual's biological and psychological aspects, while a mesosystem includes small-scale groups, such as family and peers, who surround the individual. Lastly, a macrosystem includes community, country, and social settings. The factors that affect CB and CV are diverse and complex, so using the multidimensional measurement framework of social-ecological theory is appropriate to study CB and CV.

Considering the above, the present study makes a valuable contribution to the present literature. Its purpose is to understand the prevalence of CB and CV among vocational high school students in an ethnic minority area of China and identify the factors associated with CB based on the ecological system model; as such, it can serve as a guide for CB/CV intervention.

2. Methods

2.1. Setting

The research setting was Yanji, the capital city of YKAP. YKAP has a population of 2.079 million, of which the ethnic Korean Chinese account for 35.80%. Thus far, there are 2 vocational high schools in YKAP.

2.2. Design and participants

A cross-sectional survey design was used in this study. The STROBE cross-sectional reporting guidelines were used.[26] A cluster sampling method was used to select all students in 3 grades in the 2 vocational high schools in YKAP as participants in December 2019.

2.3. Measures

Following the review of previous research[12,15] and consultation with researchers and health professionals, a short, self-administered questionnaire was designed to investigate the ecological system information. Before the formal investigation, 2 experts in pedagogy and health education were invited to inspect the rationality and logic of the questionnaire and asked to modify any unclear expressions. Fifteen questions regarding the ecological system information were investigated. Subsequently, the draft questionnaire was piloted among 30 students from the target age group, who were also asked to provide specific feedback for clarity, appropriateness, and any omissions.

Consequently, the questionnaire was amended accordingly. The final questionnaires and instruments had 2 parts, as described in the following subsections.

2.3.1. Ecological system variables

2.3.1.1. Individual system. The variables for the individual system included gender, grade, household registration, and ethnicity. The household registration groups were divided into urban and rural areas.[12]

2.3.1.2. Family system. The family system included 5 variables: family composition, parental care, family violence, parental monitoring of Internet usage, and parenting style. Based on existing studies, 4 parenting styles were identified: (1) authoritative (high-level of strictness/supervision of their children and high-level of involvement in giving them support by reasoning with them); (2) authoritarian (high-level of strictness/supervision of their children and low-level of involvement in giving them support by reasoning with them); (3) indulgent (low-level of strictness/supervision of their children and high-level of involvement in giving them support and communicating by reasoning with them); and (4) neglectful (low-level of strictness/supervision and low-level of involvement).[27]

2.3.1.3. Peer system. The peer factors included 3 variables: number of close friends, self-evaluated peer relationships, and social friends. Social friend groups have been identified to comprise individuals who have dropped out of school.

2.3.1.4. School system. The school climate included 3 self-evaluated variables: class atmosphere, school discipline, and cybersecurity education in school.

2.3.2. Cyberbullying. Students' experiences of CB were assessed using a Chinese-language questionnaire based on the Cyberbullying Inventory,[9] which included 2 forms: CB and CV. Each form consisted of 18 factors that described experiences such as making/receiving threats in a chat room. In this study, the internal consistency of the CB and CV scales was .88 and .90, respectively. According to previously reviewed research, a single incident of CB may lead to very serious consequences, and by referring to the specific definition of CB and other research, "being subjected to CB at least once" was chosen as the cut-off point for categorization.[9] Since students can potentially be perpetrators or victims, the participants were divided into 2 groups: (1) perpetrators, defined as an engagement in 1 or more of the 18 perpetration behaviors at least once within the last semester and (2) victims, defined as an engagement in 1 or more of the 18 victimization behaviors at least once within the last semester.

2.4. Ethical approval

Ethical approval was obtained from the Ethics Committee of School of Medicine, Yanbian University (No. YBM-20191012).

2.5. Procedure

The study design was approved by the school authorities, and online electronic questionnaires were distributed to the students through their teachers. An online questionnaire platform in mainland China was used in this study, and the online questionnaire function provided by the platform has been widely used in Chinese surveys (the technology platform was provided by Changsha Ranxing Information Technology Co., Ltd, China). The purpose and use of the study were explained, confidentiality was assured to all participants, and informed consent was obtained. Students were told that there was no compulsion to participate, and they were not required to answer any question that they found difficult or uncomfortable. Quality control was conducted during the questionnaire design, data collection, and post-investigation. During the questionnaire design, quality control methods included setting a questionnaire-entry password, and respondents took 15 to 25 minutes – —the estimated reasonable time – to complete the questionnaire. During the data collection period, the investigation was conducted by trained class teachers and the investigators, with a class as a unit to fill out the questionnaire in the classroom after the morning self-study. Any related questions in the process of the investigation were answered by trained class teachers and investigators. After data collection, the data were checked, and the illogical responses and unqualified questionnaires were eliminated to ensure data quality.

The student questionnaires distributed and collected totaled 2269. A questionnaire was regarded as invalid if all entries were not filled in (n = 64) and if the same rating responses were elicited for all questions (n = 49). Out of 2269 questionnaires, 2156 were found to be valid, and the overall response rate was 95.02%.

2.6. Data analysis

The data were analyzed using the IBM SPSS statistical software (version 22.1; IBM, Armonk, NY, USA). The variables for individual, family, peer, and school systems were analyzed using descriptive statistics. Descriptive analyses were performed to determine the prevalence rates of different CB roles. The differences in CB according to the variables were identified using the chi-squared (χ^2) test. A multivariate logistic regression analysis was conducted to identify the correlation factors of CB. Odds ratios (OR) and 95% confidence intervals (CI) were calculated. Statistical significance was set at $P < .05$. Unique relationships between predictors and different bullying and CB roles were analyzed using multinomial logistic regression analysis.[26]

3. Results

3.1. Ecological system characteristics of participants

The mean age of the participants was 15.96 years (SD = .79); 1676 (77.74%) were from urban areas and 480 (22.26%) from rural areas. Chinese-Korean students accounted for 36.92% of the participants. Specific information regarding the ecological system characteristics of participants is shown in Table 1.

3.2. Prevalence rate of CB

The percentages of students involved in each CB role are presented in Table 2. Most of the participants (51.62%) were involved in CB as a perpetrator. CV was more common (68.64%) than CB.

3.3. Differences according to the ecological system variables

The differences in CB and CV according to the ecological system variables are presented in Table 3. All measured variables for

Table 1

Ecological system characteristics of participants (n = 2156).

Level	Variables	Categories	Number	Percentage (%)
Individual	Gender	Boys	948	43.97
		Girls	1208	56.03
	Grade	1	758	35.16
		2	703	32.61
		3	695	32.24
	Residence	Urban	1676	77.74
		Rural	480	22.26
	Ethnic	Chinese-Korean	796	36.92
		Han	1360	63.08
Family	Family composition	Both parents	1511	70.08
		One of the parents	471	21.85
		Neither parent	174	8.07
	Parental caring	Good	1663	77.13
		Faith	229	10.62
		Poor	264	12.24
	Family violence	Yes	1879	87.15
		No	277	12.85
	Parental monitoring	Yes	304	14.10
		No	1852	85.90
	Parenting style	Authoritative	705	32.70
		Authoritarian	130	6.03
		Indulgent	1195	55.43
		Neglectful	126	5.84
Peers	Peers relationship	Good	984	45.64
		Faith	813	37.71
		Poor	359	16.65
	Number of close friends	≥4	647	30.01
		2–3	1101	51.07
		≤1	408	18.92
	Social friends	Yes	1902	88.22
		No	254	11.78
School	Class atmosphere	Good	1294	60.02
		Faith	297	13.78
		Poor	565	26.21
	School discipline	Good	777	36.04
		Faith	1041	48.28
		Poor	338	15.68
	Cybersecurity education	Good	684	31.73
		Faith	940	43.60
		Poor	532	24.68

individual, family, peer, and school systems had a statistically significant difference for CB. The following variables from each system were not statistically significant for CV: 1) personal system: grade, residence, and ethnicity; 2) family system: family composition, family violence, parental monitoring, and parenting style; 3) peer system: peers' relationship, number of close friends, and social friends; and 4) school climate: class atmosphere and cybersecurity education.

3.4. Factors associated with CB

A multivariate logistic regression analysis was performed to identify the factors associated with CB. All variables confirmed to be significant in the univariate analysis were included in the analysis.

3.4.1. Logistic regression analysis: CB perpetrator. The final logistic regression model for CB is presented in Table 4. Fourteen of the original variables remained in the final model: gender, grade, residence, ethnicity, family composition, parental care, family violence, parental monitoring, parenting styles, number of close friends, peer relationships, social friends, class atmosphere, and cybersecurity education. Senior students were less likely to engage in CB perpetration, whereas students who lived in rural areas were more likely to report CB perpetration than those who lived in urban areas (OR = 1.85, 95% CI = 1.47–2.33). Students who were Chinese-Korean were at a relatively higher probability of being a CB perpetrator. With these reference categories, it was determined that students living with neither parent were more likely to engage in CB. Students who had experienced family violence (OR = .33, 95% CI = .23–.47) had a relatively higher probability of being CB perpetrators. Students who had social friends were also at a relatively higher risk of being CB perpetrators. Finally, students who reported having poor cybersecurity education (OR = 1.89, 95% CI = 1.22–2.83) had a relatively higher probability of CB.

Table 2

Prevalence of cyberbullying items (n = 2156).

		As a perpetrator		As a victim	
	Items	Number	Percentage (%)	Number	Percentage (%)
1	Humiliate using fake photos	959	44.48	1404	65.12
2	Spread rumors	806	37.38	1212	56.22
3	Take embarrassing photos	765	35.48	867	40.21
4	Use other's username without permission	763	35.39	511	23.70
5	Kick out from chat room	759	35.20	528	24.49
6	Insult in chat room	358	16.60	925	42.90
7	Send hurtful e-mails	690	32.00	625	28.99
8	Spread information on SMS	658	30.52	614	28.48
9	Send hurtful SMS	349	16.19	552	25.60
10	Harm someone known from Internet	604	28.01	599	27.78
11	Block access by stealing password	550	25.51	593	27.50
12	Block from using SMS	533	24.72	509	23.61
13	Reach messages by stealing passwords	526	24.40	530	24.58
14	Get information without permission	472	21.89	632	29.31
15	Harm someone known from Internet	444	20.59	623	28.90
16	Threaten in chat room	414	19.20	567	26.30
17	Hide the name while sending SMS	382	17.72	651	30.19
18	Violate privacy via Webcam	356	16.51	554	25.70

SMS = short message service.

Table 3

Analysis of cyberbullying accroding to ecological system variables (n = 2156).

				As perpetrator			As victim		
Level	Variables	Categories	Total	N (%)	χ^2	*P* value	N (%)	χ^2	*P* value
Individual	Gender	Boys	948	586 (61.81)	70.362[a]	<.001	634 (66.88)	2.457[a]	.110
		Girls	1208	527 (43.63)			846 (70.03)		
	Grade	1	758	434 (57.26)	15.326[a]	<.001	582 (76.78)	38.000[a]	<.001
		2	703	335 (47.65)			464 (66.00)		
		3	695	344 (49.50)			434 (62.45)		
	Residence	Urban	1676	812 (48.45)	30.381[a]	<.001	1107 (66.05)	23.562[a]	<.001
		Rural	480	301 (62.71)			373 (77.71)		
	Ethnic	Chinese-Korean	796	451 (56.66)	12.809[a]	<.001	599 (75.25)	25.582[a]	<.001
		Han	1360	662 (48.68)			881 (64.78)		
Family	Family composition	Both parents	1511	753 (49.83)	34.615[a]	<.001	1015 (67.17)	6.654[a]	.030
		One of the parents	471	233 (49.47)			333 (70.70)		
		Neither parent	174	127 (72.99)			132 (75.86)		
	Parental caring	Good	1663	830 (49.91)	8.962[a]	.0110	1130 (67.95)	4.424[a]	.100
		Faith	229	135 (58.95)			154 (67.25)		
		Poor	264	148 (56.06)			196 (74.24)		
	Family violence	Yes	1879	904 (48.11)	72.259[a]	<.001	1263 (67.25)	13.876[a]	<.001
		No	277	209 (75.45)			217 (78.34)		
	Parental monitoring	Yes	304	140 (46.05)	4.398[a]	.0400	227 (74.67)	5.970[a]	.010
		No	1852	973 (52.54)			1253 (67.66)		
	Parenting style	Authoritative	705	369 (52.34)	10.102[a]	.0100	526 (74.61)	22.356[a]	<.001
		Authoritarian	130	69 (53.08)			85 (65.38)		
		Indulgent	1195	594 (49.71)			775 (64.85)		
		Neglectful	126	81 (64.29)			94 (75.60)		
Peers	Peers relationship	Good	984	406 (41.26)	81.739[a]	<.001	631 (64.13)	51.578[a]	<.001
		Faith	813	506 (62.24)			546 (67.16)		
		Poor	359	201 (59.99)			303 (84.40)		
	Number of close friends	≥4	647	296 (45.75)	19.341[a]	<.001	409 (63.21)	58.898[a]	<.001
		2–3	1101	574 (52.13)			727 (66.03)		
		≤1	408	243 (59.56)			344 (84.31)		
	Social friends	Yes	1902	926 (48.69)	55.793[a]	<.001	1270 (66.77)	26.337[a]	<.001
		No	254	187 (73.62)			210 (82.68)		
School	Class atmosphere	Good	1294	568 (43.89)	85.454[a]	<.001	859 (66.38)	30.685[a]	<.001
		Faith	297	168 (56.57)			245 (82.49)		
		Poor	565	377 (66.73)			376 (66.55)		
	School discipline	Good	777	388 (49.94)	6.874[a]	.0300	524 (67.44)	4.053[a]	.130
		Faith	1041	566 (54.37)			735 (70.61)		
		Poor	338	159 (47.04)			221 (65.38)		
	Cybersecurity education	Good	684	297 (43.42)	27.101[a]	<.001	388 (56.73)	73.590[a]	<.001
		Faith	940	518 (55.11)			674 (71.70)		
		Poor	532	298 (56.02)			418 (78.57)		

[a] Statistical significance was set at $p<.05$.

Table 4

Regression analysis for cyberbullying among vocational high school students (n = 2156).

Level	Variables	Categories	Reference	β	SE	Wald	*P* value	OR	95% CI	
									Lower	Higher
Individual	Gender	Boys	Girls	0.740	0.097	58.061	<.001	2.095	1.732	2.534
	Grade					19.746	<.001			
		2	1	−0.507	0.121	17.545	<.001	0.602	0.475	0.764
		3	1	−0.405	0.119	11.540	.001	0.667	0.528	0.843
	Residence	Rural	Urban	0.618	0.117	27.900	<.001	1.855	1.475	2.333
	Ethnic	Chinese-Korean	Han	0.324	0.099	10.699	.001	1.383	1.139	1.679
	Family composition					15.818	<.001			
		One of the parents	Neither parent	−0.767	0.199	14.846	<.001	0.464	0.314	0.686
		Both parents	Neither parent	−0.807	0.214	14.168	<.001	0.446	0.293	0.679
Family	Parental caring					9.427	.009			
		Poor	Good	0.401	0.165	5.911	.010	1.494	1.081	2.065
		Fair	Good	0.343	0.153	5.054	.02	1.410	1.045	1.902
	Family violence	No	Yes	−1.095	0.174	39.794	<.001	0.335	0.238	0.470
	Parenting style					11.624	.009			
		Authoritarian	Authoritative	−0.255	0.112	5.195	.020	0.775	0.622	0.965
		Indulgent	Authoritative	−0.685	0.233	8.621	.003	0.504	0.319	0.796
		Neglectful	Authoritative	−0.237	0.285	0.691	.400	0.789	0.452	1.379
Peers	Number of close friends					21.589	<.001			
		≥4	≤1	0.233	0.116	4.000	.040	1.262	1.005	1.586
		2–3	≤1	0.661	0.143	21.378	<.001	1.937	1.463	2.563
	Peer relationship					7.247	.020			
		Poor	Good	0.417	0.155	7.210	.007	1.517	1.119	2.056
		Fair	Good	0.273	0.203	1.811	.170	1.314	0.883	1.957
	Social friends	Yes	No	0.791	0.218	13.199	<.001	2.205	1.439	3.378
School	Class atmosphere					23.238	<.001			
		Poor	Good	0.783	0.164	22.644	<.001	2.187	1.585	3.020
		Fair	Good	0.176	0.213	0.683	.400	1.192	0.786	1.809
	Cybersecurity education					23.055	<.001			
		Poor	Good	0.302	0.115	6.847	.009	1.353	1.079	1.696
		Fair	Good	0.609	0.127	22.926	<.001	1.838	1.433	2.358

B = unstandardized coefficients B, β = standardized coefficients β, CI = confidence interval.

3.4.2. Logistic regression analysis: CV. The final model for CV in Table 5 shows several correlations. Students who were Chinese-Korean were at a higher risk of CV (OR = 1.56, 95% CI = 1.26–1.93). Parental monitoring of cyber use appeared to protect students from being victims (OR = .39, 95% CI = .28–.54). However, students who had few close friends, were dissatisfied with their peer relationships, or those who had social friends were more likely to experience CV. Furthermore, students who had poor cybersecurity education also had a higher probability of experiencing CV.

4. Discussion

In this study, 51.62% of the participants reported that they had engaged in CB, and 68.64% reported that they had experienced CV within the last semester, confirming that the CV/CB problem extends to students in this region and needs to be addressed. Owing to the wide variety of ways to define and measure CB, cross-cultural, age, and time of measurement differences may meaningfully influence prevalence rates; thus, a direct comparison of the prevalence rates across different regions remains a scientific challenge.[27–29] Overall, the percentage of victims was higher than that found by Athanasiou et al in 7 countries across Europe.[3] The prevalence of CB and CV measured in the present study is also remarkably higher than that from a comprehensive, global review.[4]

At the national level in China, limited studies have investigated CB or CV among vocational high school students. The present study showed a higher prevalence rate of CB and CV among vocational high school students in an ethnic area compared to the average estimated rates for high school students in central China areas; these used the same instruments and reported that 56.88% of students have been cyberbullied, and 38.84% have cyberbullied others.[9] Given that this study reported results obtained through validated and reliable instruments, it is possible to conclude, from a cultural and intracultural comparison, that the prevalence rates of CB among vocational students in ethnic areas are particularly disturbing, and prevention and intervention programs implemented by public health and school health are urgently required.

In this study, we mirrored previous studies that found varying prevalence rates among different types of CB. Specifically, "humiliate by using fake photos" (44.48%), "spread rumors" (37.38%), "take embarrassing photos" (35.48%), "use other's username without permission" (35.39%), and "kick out from chat room" (35.20%) were the 5 most frequently reported CB behaviors in this study. "Humiliate by using fake photos" (65.12%), "spread rumors" (56.22%), "insult in chat room" (42.90%), "take embarrassing photos" (40.21%), and "hiding the name via sending SMS" (30.19%) were the 5 most frequently reported forms of CV. Moreover, we also found that "humiliate by using fake photos" and "spread rumors" were the 2 most

Table 5

Regression analysis for cybervictimization among vocational high school students (n = 2156).

Level	Variables	Categories	Reference	β	SE	Wald	*P* value	OR	95% CI	
									Lower	Higher
Individual	Grade					38.179	<.001			
		2	1	−0.632	0.131	23.356	<.001	0.532	0.411	0.687
		3	1	−0.756	0.128	34.605	<.001	0.470	0.365	0.604
	Residence	Rural	Urban	0.677	0.131	26.860	<.001	1.969	1.524	2.543
	Ethnic	Chinese Korean	Han	0.448	0.108	17.113	<.001	1.566	1.266	1.937
Family	Family composition					8.307	.010			
		One of the parents	Neither parent	−0.411	0.205	4.030	.040	0.663	0.444	0.990
		Both parents	Neither parent	−0.110	0.222	0.244	.620	0.896	0.579	1.385
	Family violence	No	Yes	−0.340	0.184	3.402	.060	0.712	0.496	1.022
	Parental monitoring	Yes	No	−0.919	0.177	27.011	<.001	0.399	0.282	0.546
	Parenting style					6.927	.070			
		Authoritarian	Authoritative	0.192	0.118	2.625	.100	1.211	0.961	1.528
		Indulgent	Authoritative	−0.366	0.231	2.504	.110	0.694	0.441	1.091
		Neglectful	Authoritative	−0.277	0.303	0.833	.360	0.758	0.419	1.373
Peers	Number of close friends					69.730	<.001			
		≥4	≤1	0.379	0.132	8.268	.004	1.460	1.128	1.890
		2–3	≤1	1.457	0.177	67.748	<.001	4.294	3.035	6.076
	Peer relationship					46.356	<.001			
		Poor	Good	0.120	0.110	1.182	.270	1.127	0.908	1.398
		Fair	Good	1.153	0.171	45.419	<.001	3.167	2.265	4.429
	Social friends	Yes	No	0.889	0.244	13.250	<.001	2.432	1.507	3.923
School	Cybersecurity education					69.187	<.001			
		Poor	Good	0.566	0.119	22.754	<.001	1.761	1.395	2.221
		Fair	Good	1.144	0.14	67.077	<.001	3.140	2.388	4.129

B = unstandardized coefficients B, β = standardized coefficients β, CI = confidence interval, OR = odds ratios.

frequent types of CB or CV experienced by vocational school students. Given the current results, families and school institutions should pay attention to whether students are involved in these types of CB.

The ecological system model included gender, grade, residence, and ethnicity in the individual system. Consistent with results from other studies, we found that boys had a higher prevalence of CB than girls. The gender difference might be explained by the fact that boys tend to be more impulsive and aggressive than girls. In traditional Chinese culture, women are expected to be kind, warm, gentle, and polite, whereas men are encouraged to be more independent, risk-taking, and assertive. Another possible explanation for differences between gender might be that girls usually spend more time on homework than boys in China, and compared with boys, girls have a more rational cognition, which leads to a lower prevalence of CB.[9] However, there were no significant gender differences in experiences of CV, which is supported by previous research on adolescent victims of cyber violence.[23] Notably, among students in 3 grades, those in higher grades had a lower prevalence of CB and CV, suggesting that students in lower grades may be an appropriate target population for interventions to reduce the prevalence of CB and CV. A possible reason might be that lower-grade students do not face competitive college entrance examinations, unlike students in higher grades. Hence, they might have more time available to spend on electronic media.[28]

Moreover, the prevalence of CB among students from rural areas is higher than in those from urban areas. There are several possible explanations for this finding. First, there were more students left behind by their parents in rural areas. In the absence of parental care, students may be inclined to be violent.[19] Second, students from rural areas are more likely to experience challenges such as lack of resources, limited economic opportunities, and fewer extracurricular activities than those from urban areas, which may lead to students from rural areas having less interpersonal interaction with others and thus fewer socio-emotional skills.[30] The prevalence of CV is also higher among students from rural areas than those from urban areas. These discrepancies can be explained by the fact that students from rural households in the YKAP area may have experienced greater academic pressure than students from urban households. Regarding ethnicity, the prevalence of CB and CV among Chinese-Korean students is higher than that of Han students, which is possibly related to the Korean family environment. Owing to language and geographic location, many Koreans choose to work abroad, which may lead to emotional neglect of children. Less time for parent–children interaction over the long term may increase the frequency of students' use of electronic equipment and lead to their emotional indifference, poor expression, easier loss of control, and aggressive behavior.[21] At the same time, the long-term lack of face-to-face communication with parents could easily lead to limited time for interacting with parents, thus causing difficulties in interpersonal relations with other people in students' lives.[31] Given these potential risks, researchers must identify ways to prevent CB/CV among these populations.

The CB-related variables in the family system were family composition, parental care, family violence, parental monitoring, and parenting style. Specifically, this investigation observed that students from a 1-parent family were more likely to be involved in CB or CV. In this sample, 8.07% of the students lived with neither parent. This is because the parents of many students are rural-to-urban migrant workers or work abroad and have left their children behind, usually in the care of grandparents or other

relatives. Parental labor migration is a common phenomenon in YKAP, causing many students to feel unsafe at home.[21] The students who reported living with neither parent may have had a poor family self-concept and experienced communication problems frequently with their parents, leading to a more depressive mood, feelings of loneliness, and fewer socio-emotional skills, increasing their risk of impulsiveness and victimization during social networking.[32] Lu et al[33] found that students who experienced family violence might be predictive of bullying perpetration. One theoretical explanation for the link between witnessing violence and bullying perpetration in adolescence is a social learning theory, which posits that youths model behavior from others. Those growing up in disadvantaged communities where family conflicts and violence are common may be assumed to model these behaviors in their relationships outside the home.

It is worth noting that parental care reduced the probability of victimization.[32] Thus, interventions seeking to promote measures to combat CB may wish to include education that bolsters knowledge of adaptive parenting with a specific concentration on parental warmth and communication as a protective approach to facilitate positive CB-related communication.[23,24] Peer relationships during adolescence become more private and sensitive, and many adolescents openly choose to exclude parents from their online interactions, which suggests that parents are less competent at monitoring their adolescent children's friendships and peer interactions online. Hence, there should be more opportunities to improve parents' interactions with adolescents. This study's findings also support that CB perpetration is associated with parenting styles, which is consistent with other bullying studies. In particular, recent research[32] has reported that negative parenting (especially parenting styles related to high levels of control or punishment) increases the likelihood of adolescents developing externalized and aggressive behaviors, consistent with the findings of this study. In China and within Asian society in general, parenting styles, which include practices such as high levels of monitoring and support, seem to be better at mitigating adolescent aggression than other cultural contexts.[32–34] Therefore, regarding measures to prevent CB in other cultures, the best option could be an adaptation of these parenting behaviors (ie, monitoring and support of children) to the home culture. Future research should also longitudinally explore the role of the family to observe whether similar findings are present in other population samples.

When analyzing peer factors, the present study showed that poor peer relations, significantly fewer close friends, and having social friends positively predict both CB perpetration and victimization. These results are consistent with studies that found a negative effect of detachment from peers on bullying.[30] Students who have fewer close friends or poor peer relationships have reported higher CB or CV, which was attributed to adolescents' lack of experience in close friendships.[31] First, adolescents lacking previous experience in handling conflicts in their interpersonal relationships might explain their involvement in CB.[32] Second, their sense of poor peer relationships could frustrate their interpersonal needs, thereby increasing the risk of CB. Third, suffering experiences of detachment from a peer may increase their perceived burden and hatred. Affected students may be drawn into exchanges online, exercise less politeness when uploading content, and have an increased propensity to express hostility in their online interactions. Students who reported poor peer relationships may have a high risk of CV due to increased feelings of being burdened and disconnectedness. It is plausible that adolescents with poor peer relations might discuss CV less often with their friends and gain less support when such experiences occur.[31,32] The perception of a lack of reciprocal caring relationships with one's peers, which provides a feeling of belonging and support, may cause an adolescent to experience greater feelings of loneliness and to assess their social network more negatively.[32,33] According to researches,[16,20,21] having social friends influences students' CB or CV. Negative support from peers has been associated with CB, according to Hellfeldt et al.[24] A study suggested that students who dropped out of school were more likely to become perpetrators.[30] Adolescents who have social friends may feel bad about the social institutions in which they function; consequently, they may engage in school less and display behavioral problems, increasing their risk of peer rejection and victimization.[34,35]

The school-level factors associated with CB perpetration included class atmosphere and cybersecurity education. Perceived support in the school climate was also found to be important. This result corresponds with previous studies that reported that a negative perception of school climate was associated with lower emotional well-being and higher bullying behavior by adolescents.[36] A perceived positive class environment is positively related to reducing CB. Warm relationships with classmates and teachers affect students' sense of safety by hindering their feelings of isolation, which fosters a sense of connectedness because of perceived caring from teachers and organizations. This promotes mental health by enhancing students' socio-emotional skills and reducing violence.[37,38] Furthermore, a cybersecurity education rating of "Poor" by students was associated with a higher risk of CB and CV compared with a rating of "Good." Cybersecurity-related education in schools may improve students' sense of autonomy and lower the prevalence of misbehavior. In addition, cybersecurity education was correlated with students' increased common norms and values associated with online activity, sense of safety, and decreased rates of antisocial and insulting actions, which are likely to influence student behavior. These findings suggest that school organizations that perform well regarding leadership and management engender school climates that protect against bullying and that prevention efforts should encompass a broad range of CV types. They also demonstrate the need to equip vocational high school students with skills in communication and coping in relationships that can be applied across a spectrum of online contexts.

The findings of this study have several important public mental health implications. High levels of CB and CV involvement for adolescents in an ethnic minority area reverberates among individuals, families, peers, and school. The responsibility for maintaining students' health and safety is shared by the health, education, and social sectors, which should urgently create effective strategies to alleviate socio-ecological factors that negatively affect people exposed to CB and CV. Preventive efforts should focus on increasing awareness on how to respond to CB and CV. Adolescent healthcare professionals, parents, school managers, communities, and other professionals all have a role to play in supporting and informing students about the risks of CB and CV and guiding them to make healthy, safe choices. In addition to initial medical assessments, adolescent healthcare professionals, in conjunction with students, parents, and schools, should design a cybersecurity management plan based on guidelines for care, counseling, and educational adaptation. Research and practice should focus more on interventions for

vocational high school students who are prone to CB or CV. Students from rural areas and Chinese-Korean students are more likely to engage in CB or CV and thus are clear targets for prevention programs in educational settings. Moreover, the finding that students who experienced difficulty in peer relationships and those with poor perceived support in their family system and school climate are more likely to be involved in CB or CV also has prevention implications; a family can provide a supportive environment for adolescents in terms of self-expression. Finally, adolescent healthcare professionals should safeguard student cybersecurity and care for student health through education that targets students, teachers, and parents regarding CB and CV causes, signs, early detection, preventive measures, and effective interventions.

This study has several limitations. First, its cross-sectional nature limits our understanding of the direct causes of CB, and self-reports may introduce bias if there is an element of social desirability in responding. Second, a small sample (from 2 schools) might limit the universality of the results. In the future, large-scale longitudinal studies should be conducted to enrich the relevant research results. Furthermore, in a society with more diverse cultures and ethnicities such as China, variation between diverse cultures is likely to influence adolescent CB behaviors and experiences.

5. Conclusion

More than half of vocational high school students in an ethnic minority area of China have engaged in CB perpetration, and approximately two-thirds have encountered CV. CB is a considerable problem for disadvantaged adolescents, and thus efforts to prevent and combat this type of bullying are required. In this study, we analyzed the CB and CV factors in vocational school students in a large ethnic minority area based on the ecological system model. It was confirmed that individual characteristics, as well as environmental systems surrounding vocational school students, should be considered regarding their exposure to CB and CV.

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Author contributions

Conceptualization: Li Zhou, Chunyu Li.
Data curation: Li Zhou.
Formal analysis: Li Zhou.
Investigation: Li Zhou.
Methodology: Li Zhou.
Project administration: Li Zhou.
Resources: Li Zhou.
Software: Li Zhou, Chunyu Li.
Supervision: Li Zhou, Chunyu Li.
Validation: Li Zhou.
Visualization: Li Zhou, Chunyu Li.
Writing – original draft: Li Zhou, Chunyu Li.
Writing – review & editing: Li Zhou.

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