



Sexual and reproductive health-related knowledge, attitudes and support network of Italian adolescents

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ABSTRACT

Objectives: What is the state of sexual and reproductive health (SRH) knowledge among teens? What about adolescents' attitudes toward SRH and the available supporting network?

Study design: A cross-sectional study conducted between April and May 2018.

Methods: An anonymous 36-item questionnaire on SRH knowledge, behaviors, and networks was developed, revised and validated by a multidisciplinary health professional team, then distributed to high school students in Udine (Italy).

Results: 747 questionnaires were collected in five high schools; respondents were predominantly male, mean age 14.8 years; 48% of students have sufficient SRH knowledge (considered as above the mean value). Factors associated with higher knowledge levels were female sex, age, SES according to father's profession, first SRH information at age 11–13, Italy as country of origin, and attendance at a technical school.

Conclusions: Students' knowledge on SHR resulted relatively poor. Sex, school type and previous experience of sexuality education were the most important factor associated with SRH knowledge.

1. Introduction

Sexual health, as defined by the World Health Organization (WHO), means that every person has the opportunity to have safe sexual experiences free from coercion, discrimination and violence. This right, which applies to both women and men, must also apply to adolescents and requires free access to health information and services, as well as the provision of safe and effective contraceptive methods to ensure safe pregnancy and childbirth [1]. The contribution of sexual and reproductive health (SRH) to global and individual health has been formalized through the inclusion of specific targets in the Sustainable Development Goals Agenda for 2030 [2].

Sexually Transmitted Diseases (STDs) are a major concern in the

pursuit of SRH, as more than 1 million infections are acquired every day worldwide. These newly acquired infections are mainly caused by *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Treponema pallidum* and *Trichomonas vaginalis* but also Herpes Simplex Virus and Papillomavirus show worrying numbers [3]. Between 2004 and 2017 the number of people with STD almost doubled in Italy, reaching 6,393 new diagnoses in 2017; the prevalence of *C. trachomatis* was more than twice as high in women aged 15–24 years than in older women [4]. The burden of STDs in adolescents remains alarming, being among the top 20 global causes of DALYs (Disability Adjusted Life Years) in under-19s in 2015 [5]. Although the high STD prevalence among adolescents is due to the combination of biological, behavioral and cultural characteristics typical of this age [6], close attention must also be paid to the available

Abbreviations: Sexual and Reproductive Health, SRH; Sexually Transmitted Diseases, STDs.

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support network and potential barriers accessing health services [7], as well as changes in age of sexual debut [6,8] and increased life expectancy, which poses a risk for STDs [9].

The aim of this study was to explore the level of knowledge about STDs among adolescents aged 14–16 years, along with adolescents' attitudes and practices toward SRH and their available supporting network. Secondary objectives were to analyze factors associated with adolescents' knowledge of STDs and SRH-related networks and attitudes.

2. Material and methods

2.1. The study

Study design. A cross-sectional study called A-SCAN (Adolescenti-Sessualità, Conoscenze, Attitudini e Network; Adolescents-Sexuality Knowledge Attitudes and Network) was conducted between April and May 2018 among adolescents attending high schools in the city of Udine (North-East, Italy).

The target of the study were students attending the 1st year of high school. The choice of the first year of high school was motivated by the fact that in Italy, high schools (upper secondary) are attended by adolescents aged on average between 14 and 19 years, which represents our specific target group, even if attendance is not compulsory from the age of 16. Since in Italy a distinction is made between academic, technical and vocational high school, the study was conducted at all three types of schools. While academic high schools tend to be more theoretical, technical high schools mainly teach subjects related to the economic and productive sectors, and vocational high schools focus more on practical skills. In total, there were about 22.600 high school students in Udine in 2018, not evenly distributed among the five school years for the reasons mentioned above.

The study was presented to the principals of all 12 high schools in Udine with a presentation letter to which the preview of the questionnaire was attached. Hard copies of the questionnaire were distributed during regular classes. Eight health professionals from the local health department and Udine University supervised the questionnaire collection and were available in the classroom to answer any questions. Students were informed of the objectives of the study and the issues addressed in the questionnaire; they were advised that participation was voluntary and anonymous. Written informed consent was obtained from parents for their minor (<18 years) sons/daughters to participate. The study was conducted in accordance with all national regulations and with the principles of the Declaration of Helsinki and was approved by the Institutional Review Board of Udine University, which is the Departmental Commission for Experimentation and Personal Protection for the Department of Medicine, responsible for verifying the protection of the rights, safety and welfare of the subjects involved.

2.2. Instrument of the study

A multidisciplinary group of psychologists, public health nurses, public health specialists, gynecologists, and obstetricians developed a 36-item questionnaire. After its revision and face validation by experts in adolescent health promotion and communication, the estimated time of completion resulted to be 20 min. The questionnaire consisted of 34 multiple-choice questions and two open-ended questions on the level of knowledge about the human reproductive system and how it works, STDs, contraceptive methods, specific health services and net available. Adolescents were also asked to self-assess their knowledge (absent, poor, adequate, good) and share their attitudes and practices towards SRH. Socio-demographic information about the adolescents and their parents was also collected. The questions used to explore the knowledge, attitudes/practices and supporting network are reported in Table 1.

Table 1

English translation of the questions for the Knowledge, Attitude/Practices, and Network (K/AP/N) domains of the A-SCAN survey.

Question	Possible answers	K	AP	N
Who told you about changes in your body related to sexual development? (multiple answers allowed)	Mother/Father/Sister or brother/Friends/Physician (e. g.; family doctor, gynecologist)/School/TV/Books or magazines/Internet (websites, blogs, social networks)/Other (please specify ...)			N
Do you have the opportunity to ask your parents questions about sexuality?	Yes, any questions/Yes, but I prefer not to/Only a few/No, none			N
Who would you go to if you needed or wanted information or insight into sexuality? (maximum three answers)	Mother/Father/Sister or brother/Friends/Physician (e. g.; family doctor, gynecologist)/School/TV/Books or magazines/Internet (websites, blogs, social networks)/Other (please specify ...)			N
Do you know what a family counseling service is?	Yes/No			N
What is done at a family counseling service?	(open-ended question)			N
Is there a family counseling service in the area where you live?	Yes/No/Don't know			N
Have you ever used a family counseling service?	Yes/No because I was not old enough to do so/No because I didn't need it/No because other reasons (please specify)		AP	
Since when, in your opinion, is the male body ready to bear children?	From birth/From the appearance of first hair/From the first ejaculation/From the moment of the first sexual attraction/desire towards each other/Don't know/Other (please specify ...)	K		
Since when, in your opinion, is the female body is ready to bear children?	From birth/From the appearance of first hair/From the first menstruation/From the moment of the first sexual attraction/desire towards each other/Don't know/Other (please specify ...)	K		
Do you think that a girl can get pregnant during her first sexual intercourse?	Yes/No/Don't know		K	
Do you think that a girl can get pregnant during her period?	Yes/No/Don't know		K	
In your opinion, when is the fertile period (period when it is possible to get pregnant) in a girl, considering a 28-day cycle?	During menstruation/ Immediately after menstruation/Approximately mid-cycle/Just before menstruation/Indifferent during the whole month/ Don't know		K	
According to your knowledge voluntary interruption of pregnancy in Italy is	Legal/Illegal/Don't know		K	
Mark with a cross, for each contraceptive method: whether you only know about its existence/whether you know how it is used/whether you use it for all the following: Coitus interruptus, Male condom, Female condom, Pill, Intrauterine device (IUD), Diaphragm, Natural methods, Contraceptive patch, Other (please specify..... ..)	I know about its existence/I know how it is used/I use or used it		AP	
	Yes/No/Don't know		K	

(continued on next page)

Table 1 (continued)

Question	Possible answers	K	AP	N
In your opinion, do condoms have an expiration date?				
In your opinion, can a condom be used multiple times?	Yes/No/Don't know	K		
In your opinion, do young people use contraceptive methods?	Yes/No/Don't know	K		
Why do you think it may be that they do not use them? (multiple answers allowed)	Because they can be harmful at this age/Because they are afraid of being discovered by their parents/Because they take away the spontaneity of sex/Because it is difficult to use them/Because it is embarrassing and/or hard to hold of them/Because parents do not agree with the use of them/Because they cost too much/Because they do not know about their existence/I don't know they exist/Other (please specify ...)	K		
To the best of your knowledge, which of the following diseases can be transmitted through sexual intercourse? (multiple answers allowed)	Mediterranean Anemia/ Mononucleosis/Viral hepatitis/Diabetes/Syphilis/ Candida/Gonorrhoea/HIV-AIDS/Some cancers/ Tuberculosis(TB)/Don't know/Other (please specify ...)	K		
Please mark, for each of these routes, which one can spread sexually transmitted diseases	Vaginal intercourse/Hand shaking/Deep kissing/Anal intercourse/Toilet sharing/ Genital contacts/Oral intercourse	K		
In your opinion, which contraceptives can protect against sexually transmitted diseases? (multiple answers allowed)	None/Female condom/Coitus interruptus/Contraceptive patch/Contraceptive pill/ Intrauterine device (IUD)/ Male condom/Diaphragm/ Natural methods/Other (please specify ...)	K		
In your opinion, the attention toward HIV (Human Immunodeficiency Virus) and sexually transmitted diseases today is	High because people are better informed/High because it is easy to become infected/ Low because they are less scary thanks to treatment/ Low because it is difficult to get infected/Don't know/ Other (please specify ...)		AP	

2.3. Analysis of the data

High schools were coded into three main categories (vocational, technical and academic) according to the Italian system. Parents' occupations were classified into three main categories for simplicity: 1 (manager, freelancer, craftsman), 2 (office worker, laborer), and 3 (domestic workers, unemployed). Socio-economic status (SES) was derived using parental occupation, similar to what has been done by colleagues in Sweden [10]. When more than one choice was available, each option was structured as a yes/no response. A general knowledge score was calculated based on 13 main questions (maximum 35 points); sufficient general knowledge was determined using the mean as the threshold. Specific scores were calculated for knowledge of STDs (sufficient if ≥ 3 correct and <2 incorrect answers), prevention of STDs (sufficient if ≥ 1 correct and no incorrect answers), and contraceptive methods (sufficient if ≥ 1 of the following answers were given: I have heard of it/know about it/know how to use it/use it/used it). Descriptive analyses with frequency distribution and mean (±SD) were performed for the quantitative variables. To assess the association of items with sex and school type, Chi-Square or Fisher tests (depending on size) were performed. Multivariate logistic regression analyses, adjusted for sex

and age, were conducted to examine the characteristics of students with higher knowledge scores. All analyses were performed using SAS 9.3 for Windows (SAS Institute Inc., Cary, North Carolina, USA), considering α = 0.05.

3. Results

Five out of 12 secondary schools agreed to participate in the study, making a total of 990 students (51 classes) eligible. Parental consent was obtained from 80.9% of the adolescents (811), and a total of 747 questionnaires (75.5%) were completed. The respondents were predominantly male (58.8%) and the mean age was 14.8 ± 0.9 years. Students attending technical high schools were 311, 224 attended vocational high schools, and 212 attended academic high schools. Males were in the majority in technical high schools (86.5%) while females were more represented in academic (67.5%) and vocational high schools (54.1%). Adolescents who attended vocational high schools were older (15.3 ± 1.2 years) than others (14.6 ± 0.7 years). The full list of socio-demographic variables is presented in Table 2.

3.1. Knowledge

The mean score for adolescents' general knowledge was 26.2 ± 3.3. Girls scored slightly higher than boys (26.8 ± 3.3 vs 26.0 ± 3.0, p =

Table 2
Socio-demographic variables of respondents.

Domain	Variable	N (%)
Living place	City	189 (25.3)
	Suburbs	61 (8.2)
	Village	482 (64.5)
Country of origin	Missing	15 (2.0)
	Italy	623 (83.4)
	Other	112 (15.0)
Mother's level of education	Missing	12 (1.6)
	Primary education	12 (1.6)
	Lower secondary education	93 (12.5)
Father's level of education	Upper secondary education	400 (53.6)
	Bachelor's level	185 (24.8)
	Missing	57 (7.6)
Mother's occupation	Primary education	16 (2.1)
	Lower secondary education	129 (17.3)
	Upper secondary education	390 (52.2)
Father's occupation	Bachelor's level	146 (19.5)
	Missing	66 (8.8)
	Manager	30 (4.0)
Mother's country of origin	Freelancer/craftsman	104 (13.9)
	Office worker	324 (43.4)
	Laborer	65 (8.7)
Father's country of origin	Domestic worker	145 (19.4)
	Unemployed	31 (4.2)
	Missing	48 (6.4)
Mother's native tongue	Manager	70 (9.4)
	Freelancer/craftsman	162 (21.7)
	Office worker	188 (25.2)
Father's native tongue	Laborer	226 (30.3)
	Domestic worker	10 (1.3)
	Unemployed	22 (3.0)
Mother's country of origin	Missing	69 (9.2)
	Italy	563 (75.4)
	Other	168 (22.5)
Father's country of origin	Missing	16 (2.1)
	Italy	590 (79.0)
	Other	142 (19.0)
Mother's native tongue	Missing	15 (2.0)
	Italian	572 (76.6)
	Other	158 (21.2)
Father's native tongue	Missing	17 (2.3)
	Italian	608 (81.4)
	Other	124 (16.6)
	Missing	15 (2.0)

N: Number of observations; %: Percentage frequency.

0.0002) and scores differed between students who attended academic (26.6 ± 3.2), technical (26.4 ± 3.2) and vocational (25.6 ± 3.3) high schools. Overall, 48.2% of the respondents had adequate general knowledge and sex and school type differences were confirmed. Adolescents self-assessed their knowledge as at least sufficient in 79.9% of cases (good in 22.1%, sufficient in 57.8%). Self-assessment differed significantly by sex, with boys more likely to report a good level of knowledge ($p = 0.009$); self-assessed knowledge levels were higher among vocational students than among technical students ($p = 0.0368$). Most of the adolescents (75.5%) knew that a girl can get pregnant after the first sexual intercourse, and 21.3% of the students were able to determine the fertile period (girls: 30.0%; $p < 0.0001$), while 43.2% of them believed that conception is not possible during menstruation (boys: 34.0%, $p < 0.0001$; technical high school students: 51.1%; $p = 0.0014$). Almost all adolescents in our study knew that condoms can only be used once (93.2%), regardless of sex and high school type, but only 64.7% of them knew that condoms have an expiration date. Half of the adolescents (57.0%) reported that today's focus on HIV is high because people are better informed/knows that it is easy to become infected, and this belief was particularly true for technical high school students ($p = 0.0111$).

Overall, the ability of adolescents to identify STDs from the given list was adequate in 27.7% of cases. HIV/AIDS was the most frequently selected STD, with differences by sex ($p = 0.0125$) and school type, as this question was more likely to be given wrong answers by vocational students ($p < 0.0001$). In addition, technical high school students did not recognize genital contacts as risky (32.2%; $p = 0.0300$). Adolescents' responses on STDs and their modes of transmission are shown in [Table 3](#).

Adolescents' knowledge of STD prevention was adequate in 22.6% of cases, with no differences by sex or school type. Nevertheless, 28.3% of students believed that birth control pills protect against STD infections, leading them to potential increased risk of exposure. On the other hand, male and female condoms were not mentioned as a preventive method by 11.8% and 46.3% of the respondents, respectively. Detailed results by sex and school type are presented in [Table 4](#). Almost three quarters of adolescents have heard of the main contraceptive methods: male (98.4%) and female (88.2%) condoms, pill (97.8%), IUD (79.8%), patch (77.8%) and diaphragm (74.8%). As shown in [Table 5](#), the factors

Table 3

Identification of sexually transmitted diseases and ways of transmission, distribution by sex of respondents (n-%).

	TOTAL N (%)	MALE N (%)	FEMALE N (%)	<i>p</i> -value
Which of the following are STDs?				
Candida	176 (23.56)	77 (17.5)	99 (32.7)	<0.0001
Diabetes	15 (2.0)	12 (2.7)	3 (1.0)	0.0979
Do not know	96 (12.9)	59 (13.4)	37 (12.2)	0.6314
Gonorrhoea	106 (14.2)	71 (16.2)	35 (11.6)	0.0787
HIV/AIDS	658 (88.1)	400 (91.1)	258 (85.2)	0.0125
Mediterranean anemia	43 (5.8)	33 (7.5)	10 (3.3)	0.0156
Mononucleosis	173 (23.2)	96 (21.9)	77 (25.4)	0.2548
Other	13 (1.7)	6 (1.4)	7 (2.3)	0.3337
Some cancers	89 (11.9)	43 (9.8)	46 (15.2)	0.0257
Syphilis	173 (23.2)	111 (25.3)	62 (20.5)	0.1302
Tuberculosis (TB)	110 (14.7)	71 (16.2)	39 (12.9)	0.2174
Viral hepatitis	143 (19.1)	82 (18.7)	61 (20.1)	0.6120
Which are ways of STDs transmission?				
Anal intercourse	583 (78.1)	335 (76.3)	248 (81.9)	0.0044
Deep kissing	333 (44.6)	205 (46.7)	128 (42.2)	0.2579
Genital contact	514 (68.8)	276 (62.9)	238 (78.6)	<0.0001
Hand shaking	24 (3.2)	16 (3.6)	8 (2.6)	0.4652
Oral intercourse	406 (54.4)	251 (57.2)	155 (51.2)	0.2980
Toilet sharing	250 (33.5)	139 (31.7)	111 (36.6)	0.1238
Vaginal intercourse	706 (94.5)	423 (96.4)	283 (93.4)	0.0434

N: Number of observations; %: Percentage frequency.

significantly associated with high general knowledge were female sex, age, attending a technical high school, SES by father's occupation, first SRH information at age 11–13, and Italy as country of origin.

3.2. Attitudes and practices

Adolescents reported the male condom (16.5%), the patch (4.0%), the pill (3.0%), coitus interruptus (2.3%), and natural methods (e.g.; calendar rhythm method, basal body temperature method, mucus inspection method) (2.1%) as the most commonly used contraceptives. Differences emerged according to sex: girls were more likely to report practicing coitus interruptus ($p = 0.0418$) and to using female condoms ($p = 0.0330$), while boys were more likely to report choosing male condoms ($p < 0.0001$) or benefitting from their partner patches ($p = 0.0470$). Students attending vocational high schools were more likely than others to use coitus interruptus ($p = 0.0001$), male condoms ($p < 0.0001$), pills ($p = 0.0111$), and natural methods ($p = 0.0027$). Difficulty and/or embarrassment in purchasing (55.3%), fear of being discovered by parents (39.9%) and concern that sex would be less spontaneous (36.4%) were cited by adolescents as possible factors negatively affecting contraception. Vocational high school students were more concerned than others about possible side effects of contraceptives at their age ($p = 0.0443$) and about too high a cost ($p < 0.0001$), while the greatest concern for adolescents attending academic high schools was difficulty and/or embarrassment in purchasing them ($p = 0.0192$). Overall, family counseling services were reportedly accessed by 1.4% of adolescents, almost all of whom were females attending vocational high schools ($p < 0.0001$).

3.3. Network

Most students who received sexuality education in the past (54.8%) were 11–13 years old at the time (59.7%), while the others were 6–10 years old (25.2%) and 14–17 years old (5.4%). On average, the age at which girls received SRH information was lower than that of boys: 62.1% vs 58.8% for ages 11–13 years and 29.0% vs 22.8% for ages 6–10 years. In general, 88.6% of adolescents said they could ask their parents questions about sexuality, although 62.4% of them said they would prefer not to. Both the possibility to ask questions and the tendency to do so did not differ by sex, but the tendency not to talk to parents was higher among students of vocational high schools (12.5%; $p = 0.0011$). Mothers (51.0%), the Internet (42.2%), friends (33.7%), doctors (32.3%), and fathers (27.7%) were found to be the preferred sources of information about SRH. Girls were more likely to indicate mother ($p < 0.0001$), while boys were more likely to indicate school ($p = 0.0499$), friends ($p = 0.0292$), internet ($p = 0.0038$) and father ($p < 0.0001$), with the latter also more often preferred by students of technical high school ($p < 0.0001$). It is significantly worrying that 79.5% of adolescents were not aware of the existence of family counseling services and family planning clinics; nevertheless, another 9.4% of students could describe the services or access criteria, and 7.8% knew that they were available in their area of residence. Awareness of the existence and availability of these services was higher among girls and vocational students than others.

4. Discussion

The general level of knowledge was inadequate among half of adolescents, and significant knowledge gaps emerged from our survey. Of concern, for example, are the lack of knowledge that condoms have an expiry date [11], the existing doubts that anal or oral sex are considered risky behaviors [12], the lack of identification of hepatitis B, syphilis, and gonorrhoea as STDs, and the greater misperception of candida infection [12–14]. Consistent with previous studies, factors such as age [15,16], female sex [16–18], no migrant background [17,19], and social status [16] were associated with higher general knowledge. Our results

Table 4

Identification of methods to prevent sexually transmitted diseases, distribution by sex and high school type attended by respondents.

Which are methods to prevent STDs?	Total N (%)	Sex		p-value	High school type			p-value
		Male N (%)	Female N (%)		Academic N (%)	Vocational N (%)	Technical N (%)	
Coitus interruptus	38 (5.1)	27 (6.2)	11 (3.6)	0.1256	6 (2.8)	8 (3.6)	24 (7.7)	0.0199
Contraceptive patch	54 (7.2)	36 (8.2)	18 (5.9)	0.2471	19 (9.0)	12 (5.4)	23 (7.4)	0.3296
Contraceptive pill	211 (28.3)	132 (30.1)	79 (26.1)	0.2420	60 (28.3)	63 (28.1)	88 (28.3)	0.9909
Diaphragm	39 (5.2)	32 (7.3)	7 (2.3)	0.0029	12 (5.7)	8 (3.6)	19 (6.1)	0.3881
Female condom	392 (52.5)	262 (59.7)	130 (42.9)	<0.0001	103 (48.6)	99 (44.2)	190 (61.1)	0.0001
Intrauterine device (IUD)	74 (9.9)	53 (12.1)	21 (6.9)	0.0220	17 (8.0)	15 (6.7)	42 (13.5)	0.0169
Male condom	650 (87.0)	398 (90.7)	252 (83.2)	0.0024	179 (84.4)	185 (82.6)	286 (92.0)	0.0005
Natural methods*	17 (2.3)	12 (2.7)	5 (1.7)	0.3343	3 (1.4)	8 (3.6)	6 (1.9)	0.2875
None	27 (3.6)	12 (5.0)	15 (3.6)	0.1116	12 (5.7)	8 (3.6)	7 (2.3)	0.1220
Other	22 (3.0)	12 (2.7)	10 (3.3)	0.6510	8 (3.8)	7 (3.1)	7 (2.3)	0.5927

N: Number of observations; %: Percentage frequency; *(e.g.; calendar rhythm method, basal body temperature method, mucus inspection method).

Table 5

Characteristics of respondents associated with high general and specific STD knowledge: results of multivariate logistic regression analysis adjusted by sex and age.

Effects	OR	95%CI
Sex: female vs male	1.981	1.289–3.045
Age	1.336	1.070–1.668
Academic vs technical high school	0.675	0.412–1.107
Vocational vs technical high school	0.407	0.249–0.667
SES according to father occupation 1 vs 3	1.260	0.751–2.114
SES according to father occupation 2 vs 3	2.001	1.276–3.139
SRH information at 3–5 years vs none	1.287	0.278–5.960
SRH information at 6–10 years vs none	2.091	0.993–4.407
SRH information at 11–13 years vs none	2.567	1.277–5.159
SRH information at 14–17 years vs none	1.165	0.429–3.163
Country of origin Italy vs other	2.049	1.220–3.440
Knowledge about STDs		
SES according to mother occupation 1 vs 3	0.494	0.287–0.851
SES according to mother occupation 2 vs 3	0.589	0.375–0.926
SRH education yes vs no	2.449	0.914–6.559
SRH education yes vs not known	1.626	0.596–4.433

N: Number of observations; %: Percentage frequency.

show that lack of knowledge and poor perception about sexual risks are associated with confirmed confusion about STDs prevention methods, with the pills, IUD, and diaphragm considered effective methods [12,14,17]. Furthermore, STD prevention among adolescents is undermined by the confirmed attitudes of adolescents reported as the difficulty and/or embarrassment of purchase, fear of parental discovery of use, and worsening spontaneous sexual intercourse as major barriers to using STD prevention methods [12,20]. Similar to Samkange-Zeeb et al. [17], despite these worrying findings, adolescents' self-assessed knowledge of these topics is disproportionately high, contributing to worsen the overall picture.

The exposure of our adolescents to SRH education is similar to other Italian regions [13], but still remains much lower compared to other European countries [16]. Accordingly, the supporting network available to adolescents in terms of access to SRH information is limited to parents [12,16,17,20,21], friends [12,16,21,22], and the Internet [12,17,20], although school also plays an important role [12–14,17]. Although a significant proportion of adolescents reported that they can discuss their doubts about SRH with their family, their individual access to health services still appears to be inadequate.

4.1. Sex-based differences

In line with previous research findings, sex appears to have an impact on knowledge [16–18], with girls significantly underestimating their knowledge but performing better. As confirmed by previous findings, boys recognized vaginal intercourse better than girls, while awareness of

the risk of STDs associated with anal intercourse and genital contact was higher in girls [14]. Regarding the STD identification from the given list, girls more often misidentified Candida and less often identified HIV/AIDS than boys [14]. The observation of the attitudes of girls to resort more to coitus interruptus and less to condoms than boys could be explained by the fact that girls are more likely to have their sexual debut with older boys [8] and that condom use gradually decreases with age [22]. The lower age of girls when they are first educated about SRH could be a confirmation that attention to female-sexual behavior is more anticipatory than male [23–25]. These observations confirm the need to include boys in STD prevention interventions [26]. In line with previous research on sources of information (in this study considered as part of the available network), it is confirmed that girls prefer to refer to their mothers [14] and boys prefer to use new media [17], peers [12,27] and school [6]. Girls' preference for mothers could act as a protective factor, as a good relationship between girls and mothers has been shown to reduce adolescent sexual risk behaviors [28] and increase condom use [29]. However, if the finding of girls' better knowledge of the available supporting network is the result of greater accessibility of family counseling services to women, this could also indicate an urgent and late need to prevent unwanted pregnancy. On the other hand, men have already been reported to less likely access health care services [30,31], this possibly being an adverse effect of the health promotion and prevention services design which has been traditionally more focused on women. Such differences related to sex are worth to be studied in more detail in future research, as adolescence seems to be the first break point in gender equality which tends to extend its negative effects into adulthood [32].

4.2. School type-based differences

Vocational high school students rated their knowledge highly when in fact they have the poorest outcomes; on the contrary, our data confirm evidence that academic high school students tend to underestimate their knowledge [13]. Knowledge gaps regarding STD transmission and prevention persist among technical high school students, although the phenomenon seems to be lower compared to previous reports [13]. A school-specific pattern seems to emerge, in which academic high school students have not yet had much exposure to sexuality, while adolescents attending vocational high schools are beginning to experience it. Data on vocational high school students' higher awareness of the availability and accessibility of counseling and health centers seem to confirm this notion. Although vocational students are likely to be making their sexual debut, those who receive SRH information later are less likely to discuss these issues with parents and consider high costs and fear of side effects as barriers to contraceptive use, which is a worrying issue.

4.3. Limitations and strengths of the study

First, school participation in our study was suboptimal, potentially affecting representativeness, as previously experienced by colleagues [13]. Although we did not collect data on the reasons for some schools' refusal to participate in the study, a lack of awareness and confidence among teachers about SRH issues, as well as a lack of time for extra-curricular projects, may have played an important role. It is worth reminding teachers and parents that talking about SHR to adolescents does not correlate with their risky sexual behavior [21], but on the contrary it effectively helps in preventing undesirable consequences [33]. Although this was a voluntary survey, we obtained parental consent comparable to recent Italian [12,20] and German studies [17] and a satisfactory response rate among adolescents, giving us a good picture of the subject. Moreover, in order to avoid possible selection biases related to school dropout or socio-cultural aspects influencing family choice, we chose to conduct the study among students in the first year of high schools, which is compulsory in Italy, and to include all types of schools. Second, the reliability of the data could have been affected by social desirability bias, even if the students were assured of the anonymity of the survey and the focus was posed on the objectives of the study. Third, the unavailability of information about respondents' sexual debut, due to school concerns, created an information gap that may complicate interpretation of the results. Even if this information was not available, the choice of target group based on data reported from recent studies (15–16 years) [12,20] was a good decision. Finally, students' low knowledge of parental SES prevented us from collecting accurate data on this possible associated factor.

Conducting the survey with first-year students will allow the schools and local health departments that participated in this project to provide SRH education tailored to the needs of adolescents in subsequent years. School engagement is essential to SRH education [6,12] because by implementing comprehensive sexuality education programs, they can guarantee adolescents the right to equal access to health information and prevention of negative consequences [16,26].

5. Conclusions

In conclusion sex, school type and previous experience to sexuality education are confirmed to be the most important factors associated with adolescents' knowledge of SRH. The type of school attended should be taken into account when planning educational interventions and, most importantly, both boys and girls should be targeted when designing health and social services for adolescents. School-based education interventions should ensure that adolescents have access to information, but greater engagement of teachers and parents is also desirable to achieve the best results.

Ethical approval

The study was approved by the Institutional Review Board of Udine University (approval no. 47/IRB_BRUSAFERRO_18).

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Authors' contributions

LB, LL, FR, and EB conceptualized and designed the study. SP, EB, SM, ADO and MR collected data. GB carried out the analyses. LB and FR written the original draft. SB coordinated, supervised, and critically reviewed the manuscript for important intellectual content. All authors reviewed and approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Declaration of competing interest

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