

ORIGINAL ARTICLE

A survey on knowledge and perceptions regarding head lice on a sample of teachers and students in primary schools of north and south of Italy

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Key words

Pediculosis • Head lice infestation • Health Education • Primary School

Summary

High rates of pediculosis are found in every part of the world. The age-range most affected is between 3 and 12 years. No-nit policies are ineffective in preventing infestations. On the other hand, misdiagnosis and overuse of pediculicides, increase resistance to treatment. Lack of information leads people to consider this kind of infestation to be associated to low social classes and immigrants.

This research has been implemented to find out about the information level on pediculosis on a sample of students (722) and teachers (408) of some primary schools in northern and southern Italy, and to highlight the role of personal aspects such as age, gender, cultural level, geographical position which may influence this topic and, eventually, allow the use of the correct knowledge in developing appropriate procedures within the school district. Data was obtained through a questionnaire containing 21 multiple choice questions for the teachers and 14 for the students. Standard descriptive statistics were computed. χ^2 tests were applied to highlight statistical association among observed variables; test for the difference of two proportions were applied to confirm significant differences among the observed proportions.

The level of information for students seems to be, approximately, the same both for northern and southern Italy. There was a slight prevalence of correct answers from southern teachers, probably because the phenomenon of pediculosis has a positive trend of growth in the south. The number of correct answers was, for all, on average about 60.0%; a negative result in itself, considering the simplicity of the questions. Knowledge about the biology of the louse was virtually absent. The area of prevention showed lack of information and need for improvement. Most of the teachers believe that there are specific products that can prevent infestation by louse. Most of the teachers have information which does not come from scientific sources. Students receive some short and incomplete information from their parents. Deficiencies in teachers' knowledge indicate that they are inadequately equipped to manage lice infestation. Educational interventions with teachers and families and, as a consequence, with students should be taught at school to allow a correct understanding of the pediculosis, increasing the teachers' competence and, consequently, as soon as the infestation should manifest, a rapid alert of the Health Service so that proper treatment could be provided.

Introduction

Millions of individuals, most frequently from 3 to 12 years old, are infested with lice each year. Due to lack of correct information and procedures for appropriate action, the management of episodes of pediculosis in schools is difficult [1-3].

Pediculosis is increasing in every country of the world and it is perceived as a public health problem. In Italy, 25.0% of schools throughout the country experience an outbreak of epidemic pediculosis during autumn, with an estimated prevalence of between 8.0 and 10.0% over the entire primary school population [4]. Research indicated that the number of pharmaceutical preparations used annually for the treatment of pediculosis was one million. [5].

In Europe, high rates can be found in almost all countries [6], from France to Germany, from Spain to Greece, from the Balkans to the United Kingdom and Poland [7-11]. Elevated prevalence values are reported

both in industrialized countries and in developing ones: Pakistan as well as Argentina, Australia and India [12-16]. From the USA to Brazil, Korea, Iran, Turkey, the Ivory coast, and all over the world there have been experiences of epidemics and elevated prevalence especially among children in the first ten years and in primary schools. In some cases the prevalence reached more than 60.0% [17-22].

The louse (*pediculus humanus capitis*) normally does not transmit infections and consequences of the infestation are not severe. The most relevant effects of pediculosis are social, associated with:

- a) the deep-rooted idea that the louse can transmit infections;
- b) the idea that the infestation is linked mainly to poor hygiene conditions and low personal care, which negatively labels those who have pediculosis;
- c) social exclusion, especially in Western Europe, related to people's perception and immediate association in almost all cases in schools, that the origin

of the infestation is strictly linked to non European immigrant children.

In some groups of people there are some factors, such as age, gender, social, economic and cultural status, which influence the course and distribution of the infestation [20, 23, 24]. The lack of information means that pediculosis is almost always incorrectly dealt with, and also leads to unjustified panic at all levels (teachers, students and families). Consequently, no scientific action is taken. Misdiagnosis and the panic generated by fear of damaging families' social image, perceived as degraded, brings about, in most cases, an overuse of pediculicides, the effect of which is to increase resistance to the substances used for treatment.

Most of the reports in the literature deal with prevalence and treatment of pediculosis. Little work has been performed to evaluate knowledge, understanding and perceptions regarding head lice in teachers and families. Survey data from Toledo, USA, found that teachers needed more knowledge regarding head lice. Most of the primary teachers (71.0%) reported they received their head lice information from school nurses and 63.0% said they would like more information on prevention and management of infestation [25]. School nurses, too, however, needed to get more acquainted with the occurrence of pediculosis and to be better trained [26]. Parental beliefs and perceptions generated worry and confusion as well as unhealthy action to combat infestation; the parents' educational level was inversely correlated to the number of positive cases [27]. A survey from North Queensland, Australia, reported that parents were not well equipped to manage lice infestation. Only 7.1% of the responders completed the questionnaire and more than one third failed to answer half correctly. 67.0% of parents used preventive strategies and an alarmingly proportion of children were missing school [28]. At school, the argument seems to be almost totally absent from the health education programs, even in those schools that have programs or teaching interventions of such a kind [29]. This research is aimed, therefore, to detecting the level of knowledge, understanding and possible related behavior linked to the perception of pediculosis on a sample of teachers and students from some primary schools in Italy.

Objectives and methods

Specific objectives of this study were to:

- assess the degree of knowledge and perceptions of teachers and students about concepts related to biology, symptoms, treatment and prevention of pediculosis;
- assess the "balance" between family influences, educational level of the family and correct school education, including scientific information;
- detect any scientific training, if any, on the matter which could be considered as curricular;
- highlight, in cases where teachers should be properly trained, and families correctly informed, that

this training would be an efficient and effective tool for managing recurrent episodes of pediculosis in schools and would allow the development of appropriate procedures within the school.

The sample. Individuals in the sample were randomly chosen. A two stage proportional stratified sampling procedure was carried out. Cluster sampling was the statistical method used to choose the individuals. In both regions one school was selected at random from the ones in the center of a large city ($> 10^5$ inhabitants), another one from a medium sized city ($\approx 5 \times 10^4$ inhabitants), the third from a small town ($\approx 10^4$ inhabitants). Schools were contacted and informed about the objectives of the survey and cooperated completely. None of the chosen schools recollected any episode of pediculosis within the previous twelve months. Students and teachers were selected in the 3 areas (small, medium and large), with samples belonging to different classes. The presence of students (722, 354 north and 368 south) in comparison with the teachers (408, 202 north and 206 south) is the result of the division in proportion. Big schools may have more than 100 teachers including those who assist disabled children. The social context of attending schools is defined as medium in all cases. Only those students in the last three curricular years who were attending school regularly were considered as potential individuals for the sampling procedures.

The questionnaire. Data referring to knowledge, perceptions and behavior in relation to the phenomenon of pediculosis, was obtained through a questionnaire with multiple choice answers. The questionnaire was prepared drawing from the already existing literature [30, 31] and was pre-tested and validated in different contexts and small samples [32, 33], resulting in good levels of understanding, acceptability and reliability. The presence of some control items has been provided to check the reliability of collected data.

The teachers' questionnaire included 21 multiple choice answers questions. The first five questions referred to the characteristics and the biology of the head louse, the subsequent eight questions referred to the treatment, while the last eight questions related directly to the management and prevention of infestation.

In the students' questionnaire, only 14 multiple choice questions were administered, as a child's attention span is shorter than that of an adult. However, it was still possible to statistically cross the results between teachers and students. The first five questions referred to the characteristics of the head louse, the remaining nine to how to behave in case of pediculosis. Eleven questions of the teachers' questionnaire were not asked to the students (2, 6, 7, 8, 9, 12, 15, 16, 17, 18, 21) and four new questions (3, 6, 7, 10) were included, enunciated in a simpler way. The excluded part of the questionnaire, which referred to some topics on biology, symptoms, treatment, prevention, disinfestation, active action in the school and role of the National Health Services, was not considered suitable for the children.

Some personal information was also included in both of the two subgroups (north and south) to verify the presence of statistical association between these variables

and the degree of information on pediculosis. Concerning the present paper, the use of the term “subgroup” from now on will directly refer to northern and southern individuals.

The cultural level of the families was based on the Italian school-leaving certificates: primary, middle, diploma, university degree. Cultural level referred to the highest ranking certificate in the family. Although from a methodological point of view it would have been better to create a new variable coming from the union of each individual’s culture within a family, thus constructing a specific indicator of every family cultural level, it was thought that such an indicator would have raised the problem of the frequency of non homogeneity in modern families, and, all things considered, it was preferred to refer to a simpler and immediately readable index. Students were asked the profession of the father. Students and teachers were also required to indicate their main sources of information. The interviewers all received special training on how to conduct interviews in order to ensure uniformity of behavior without interfering with the individuals but being sure about the right understanding of the questions. Questionnaires were enclosed.

The absolute respect of privacy was assured to the interviewees. All subjects were told that participation in the investigation was voluntary and that the data collected would only be used for this study. Participants were assured of the confidentiality of their response and provided informed consent. Ethical permission for the study was obtained prior to collecting data and after perusal of the results by the University Ethic Committee and by the School Authority. The survey was conducted during winter 2007.

Statistical analysis. The answers to questionnaires were numerically codified and data was analyzed using *Statistica* and *OpenStat* software with respect to the whole population and to the subgroups. Standard descriptive statistics (percentages, means, standard deviations) were computed to describe the sample. χ^2 tests were performed to confirm statistical association in the observed variables. Tests for the differences of two proportions were performed to highlight significant differences in the observed percentages. The law of large numbers assured a Gaussian distribution. The relative consistency of the sample, made the estimation of confidence intervals to 95% possible both for northern and southern individuals, considering the observed data as normal distribution to zero mean and unitary variance. A p-value < 0.05 was considered significant.

Results

Two groups of students and teachers in primary schools of the North and the South of Italy were surveyed. The sample of the North of Italy consisted of 354 students and 206 teachers from three different primary schools in the Northeastern (Veneto) Region. The sample of the South of Italy consisted of 368 students and 202 teachers, from three different primary schools in Western Sicily. The total amount of individuals in the sample was 1130.

Table I crosses student’s age, geographical position and gender. The rationale underlying this choice was to check whether the sample was not balanced between the northern and southern students. A test for the difference of two proportions was performed in order to highlight potential differences in the observed proportions between males, females, and the total of individuals having a certain age and belonging to north or south subgroups. In all of the three cases, there were no significant differences ($p > 0.05$). The sample appeared well distributed for age, gender and geographical position.

Table II crosses students’ geographical position with their fathers’ occupation and families’ cultural level. In the first part of the table, the applied chi square test showed a significant difference in proportions between northern and southern fathers working as professionals (14.1% versus 9.0%; $p < 0.05$), and north and south fathers working in the public sector (25.4% versus 34.5%; $p < 0.05$). Anyhow, the total distribution of the sample was balanced, and the individuals were distributed in an acceptable way across all the available depicted possibilities.

Concerning the second part of Table II, data was obtained crossing geographical position versus family cultural level. Although overall data may indicate a slightly lower cultural level in the south (51.7% vs 54.1%), no significant differences were observed between the two groups (north and south) and the total distribution was well balanced among the school-leaving certificates. The tests of two proportions supported this conclusion. It may be interesting to note, moreover, that the percentage of degrees (16.2%) was in line with the reported percentage of the Italian National Statistics Institute (ISTAT). A further analysis was conducted in Table II, performing chi square test for geographical position versus fathers’ profession and family cultural level. The first test gave a significant statistical association be-

Tab. I. Age of students versus gender.

	Males North		Males South		Test of two proportions	Females North		Females South		Test of two proportions	Total North		Total South		Test of two proportions
Age	N	%	N	%	p value	N	%	N	%	p value	N	%	N	%	p value
8	60	16.7	68	18.9	ns	68	18.8	57	15.7	ns	128	36.2	125	34.0	ns
9	58	16.1	54	15.0	ns	50	13.8	60	16.6	ns	108	30.5	114	31.0	ns
10	53	14.7	67	18.6	ns	65	18.0	62	17.1	ns	118	33.3	129	35.1	ns
Total	171	47.5	189	52.5		183	50.6	179	49.4		354	100.0	368	100.0	

Tab. II. Students' distribution according to their fathers' occupation and cultural level.

	Professional		Private		Public		Other		Total	Chi square test
	N	%	N	%	N	%	N	%	N	p - value
North	50	14.1	90	25.4	90	25.4	124	35.0	354	< 0.05
South	33	9.0	85	23.1	127	34.5	123	33.4	368	
Total	83	11.5	175	24.2	217	30.1	247	34.2	722	
Test 2 prop.	p	< 0.05	p	ns	p	< 0.05	p	ns		
	Primary		Middle		Diploma		Degree		Total	Chi square test
	N	%	N	%	N	%	N	%	N	p - value
North	69	19.5	114	32.2	112	31.6	59	16.7	354	ns
South	70	19.0	129	35.1	111	30.2	58	15.8	368	
Total	139	19.3	243	33.7	223	30.9	117	16.2	722	
Test 2 prop.	p	ns	p	ns	p	ns	p	ns		

tween the two observed variables ($p < 0.05$). It seemed, on the contrary, that there was no association between being in northern or in southern subgroups and family cultural level.

Some personal information, concerning teachers, had been reported in Table III. The age of teachers showed no evident differences between north and south, but a wide range in total (from 27 to 60 years old). Females are more numerous than males: this data reflects the specific situation of the job concerned. Moreover, it is worth underlining that females started with an age of 27 while males from 31 (north) or 32 (south), but females had a larger age range (27-60 vs 31-58) and a higher standard deviation in the two subgroups (4.21 vs 3.23 north and 4.99 vs 3.78 south).

Starting from the year 1998, in Italy, a University Degree for teaching in primary schools was instituted. Consequently there are teachers holding a Diploma and others holding a Degree. Teachers who have a degree (47.8%) were slightly more than those who have just a diploma (37.3%). Those teachers who have a specific title in working for handicap were about 15.0%. Both for north and south subgroups, the percentages of teachers with diploma, degree and specialization for teaching to special needs children (37.4% vs 37.1%, 47.6% vs 48.0% and 14.9% vs 15.0%) were practically the same as the percentages obtained disaggregating by gender, north vs south (37.1% vs 35.2%, 46.8%

vs 50.0%, 16.1% vs 14.8% males – 37.5% vs 37.8%, 47.9% vs 47.3%, 14.6% vs 14.9% females). This fact could be explained with the type of selection and rules for hiring teachers, giving uniformity to teaching staff in Italy. A chi square test applied crossing geographical position with cultural level according to the different depicted cases (diploma, degree, specialization) showed no association between these two variables ($p = ns$). The chi square test applied for teachers' gender and cultural level, showed significant results for both the north and the south ($p < 0.01$) thus confirming a statistical association between the two observed variables.

Table IV reported the items referring to the information level on head louse. Items were ordered trying to follow the numbers of the two questionnaires which were slightly different. Regarding the students' section, items 2, 11, 12, 14, had a very low percentage of correct answers both for north and south (18.0% vs 19.0%, 14.0% vs 11.0%, 19.0% vs 26.0%, 25.0% vs 25.0%). Over 14 questions, the same ones had the highest information problems in both groups, and this aspect cannot be considered a simple coincidence. Concerning the other questions, the percentage of correct answers seems to settle at a good level, in fact only items 9 and 13 exceed 40.0% of incorrect answers. Only concerning the lack of information in item 9 (54.0% vs 40.0%, $p < 0.05$) there was a significant difference in the proportions. The other ones were almost equal. The items with the lowest

Tab. III. Teachers' distribution according to gender, geographical position and cultural level/specialization.

		Age		Range	Diploma		Degree		Disability		Chi square test
		N	(μ) - (σ)		N	%	N	%	N	%	
North	Male	62	42.2-3.23	31-58	23	37.1	29	46.8	10	16.1	< 0.01
	Female	144	38.2-4.21	27-52	54	37.5	69	47.9	21	14.6	
South	Male	54	44.6-3.78	32-56	19	35.2	27	50.0	8	14.8	< 0.01
	Female	148	46.2-4.99	27-60	56	37.8	70	47.3	22	14.9	
Total	North	206	40.2-3.89	27-58	77	37.4	98	47.6	31	15.0	ns
	South	202	45.4-4.32	27-60	75	37.1	97	48.0	30	14.9	
	Total	408	48.6-4.09	27-60	152	37.3	195	47.8	61	15.0	

Tab. IV. Comparison of the answers given among Teachers and Students.

Question n. Item ... correct answer		North T	South T	χ^2 test p value	N.	North S	South S	χ^2 test p value
1 The louse is: ... an insect	Correct Incorrect	94.0% 6.0%	98.0% 2.0%	ns	1	82.0% 18.0%	84.0% 16.0%	ns
2 Order they belong to: anoplura	Correct Incorrect	32.0% 68.0%	46.0% 54.0%	< 0.05				/
3 The louse has: three pairs of legs	Correct Incorrect	63.0% 37.0%	28.0% 72.0%	< 0.01	2	18.0% 82.0%	19.0% 81.0%	ns
4 Lice are transmitted: through scalp contact	Correct Incorrect	43.0% 57.0%	71.0% 29.0%	< 0.01	4	76.0% 24.0%	65.0% 35.0%	ns
5 Head lice infestation: the scalp only	Correct Incorrect	77.0% 23.0%	67.0% 33.0%	ns	5	81.0% 19.0%	79.0% 21.0%	ns
6 Pediculosis: a temporary	Correct incorrect	100.0% 0.0%	96.0% 4.0%	ns				/
7 Treatment: permethrine	Correct Incorrect	56.0% 44.0%	89.0% 11.0%	< 0.01				/
8 How to treat: specific product	Correct Incorrect	92.0% 8.0%	96.0% 4.0%	ns				/
9 In case of pediculosis: only the individual	Correct Incorrect	83.0% 17.0%	34.0% 66.0%	< 0.01				/
10 Lice are associated with: all social classes	Correct Incorrect	92.0% 8.0%	96.0% 4.0%	ns	9	46.0% 54.0%	60.0% 40.0%	< 0,05
11 Lice like: dirty and clean hair	Correct Incorrect	90.0% 10.0%	94.0% 6.0%	ns	8	63.0% 37.0%	68.0% 32.0%	ns
12 To know if infested: visualize eggs	Correct Incorrect	61.0% 39.0%	81.0% 19.0%	< 0.01				/
13 Preventive shampoo: do not exists	Correct Incorrect	28.0% 72.0%	37.0% 63.0%	ns	11	14.0% 86.0%	11.0% 89.0%	ns
14 Shampoo: only lice	Correct Incorrect	26.0% 74.0%	32.0% 68.0%	ns	12	19.0% 81.0%	26.0% 74.0%	ns
15 Pediculosis at school: students treated properly	Correct Incorrect	84.0% 16.0%	69.0% 31.0%	< 0.01				/
16 Guidelines: by Sanitary services	Correct Incorrect	26.0% 74.0%	25.0% 75.0%	ns				/
17 Sanitary service check is useless	Correct Incorrect	10.0% 90.0%	13.0% 87.0%	ns				/
18 Readmission: simply justify	Correct Incorrect	50.0% 50.0%	90.0% 10.0%	< 0.01				/
19 Personal objects: no treatment	Correct Incorrect	65.0% 35.0%	50.0% 50.0%	< 0.05	14	25.0% 75.0%	25.0% 75.0%	ns
20 Infested clothes: washed at home	Correct Incorrect	100.0% 0.0%	96.0% 4.0%	ns	13	50.0% 50.0%	60.0% 40.0%	ns
21 Prevention possible: no	Correct Incorrect	67.0% 33.0%	5.0% 95.0%	< 0.01				/
Lice: produce itching	Correct Incorrect			/	3	86.0% 14.0%	86.0% 14.0%	ns
If one is infested: properly treated	Correct Incorrect			/	6	64.0% 36.0%	58.0% 42.0%	ns
Lice can be found: any type of place	Correct Incorrect			/	7	74.0% 26.0%	75.0% 25.0%	ns
How getting ahead: a specific product	Correct Incorrect			/	10	60.0% 40.0%	71.0% 29.0%	ns

percentages of correct answers among the students were crossed with the cultural level of the families (Tab. V). Reported data showed that contribution in the number of incorrect answers decreased with the increasing of the

family cultural level. Also correct use of pediculicides was observed to be directly correlated with cultural level of the families and treatment carried out *only when lice or eggs are seen* (10C, data not shown).

Tab. V. Students' least correct answered items versus cultural level of family.

	Primary (%)		Middle (%)		Diploma (%)		Degree (%)		Total correct answers	
	N	%	N	%	N	%	N	%	N	%
Item 2	27	10.1	48	18.0	67	25.1	125	46.8	267	100.0
Item 11	16	8.9	37	20.6	58	32.2	69	38.3	180	100.0
Item 12	41	12.6	61	18.8	102	31.4	121	37.2	325	100.0
Item 14	59	16.3	88	24.4	100	27.7	114	31.6	361	100.0

A similar discussion, as done for students, could be afforded for teachers in Table IV. Concerning northern teachers, items 2, 4, 13, 14, 16, 17 had a very low percentage of correct answers (32.0%, 43.0%, 28.0%, 26.0%, 26.0%, 10.0%). The southern teachers' section reported that items 2, 3, 9, 13, 14, 16, 17, 21 had the

lowest correct answer percentages (respectively 46.0%, 28.0%, 34.0%, 37.0%, 32.0%, 25.0%, 13.0%, 5.0%). As was evident, the items which were "an information problem" for teachers, were not the same, as it was observed among the students. Concerning the other questions, the percentage of correct answers seems to settle at a good

Tab. VI. Association within the chief section correct answers (N°) versus gender and geographical position.

Correct answers (N)		Teachers		χ^2	Students		χ^2	
Morphology		Males	Females	Yates' correction	Males	Females	Yates' correction	
	North	25	103	p < 0.01	North	82	174	p < 0.01
	South	47	78		South	127	147	
		Diploma	Degree			Diploma	Degree	
	North	32	96	p < 0.01	North	83	187	p < 0.05
	South	55	70		South	102	148	
Symptoms		Males	Females		Males	Females		
	North	58	124	ns	North	69	183	p < 0.01
	South	52	142		South	178	176	
		Diploma	Degree			Diploma	Degree	
	North	47	119	ns	North	123	167	p < 0.01
	South	54	126		South	160	156	
Prevention		Males	Females		Males	Females		
	North	32	116	p < 0.05	North	31	27	p < 0.05
	South	16	138		South	13	30	
		Diploma	Degree			Diploma	Degree	
	North	23	122	ns	North	6	40	ns
	South	40	117		South	9	46	
Treatment		Males	Females		Males	Females		
	North	52	94	p < 0.01	North	90	133	p < 0.05
	South	30	118		South	118	107	
		Diploma	Degree			Diploma	Degree	
	North	15	123	p < 0.01	North	35	167	p < 0.01
	South	39	117		South	87	159	
Teachers				Students				
Chief section	Correct	Incorrect	C I for correct		Correct	Incorrect	C I for correct	
Morphology	62.0%	38.0%	55.3 ----- 68.7		72.0%	28.0%	67.3 ----- 76.6	
Symptoms	92.0%	8.0%	88.3 ----- 95.7		84.0%	16.0%	80.2 ----- 87.8	
Prevention	74.0%	26.0%	68.0 ----- 80.0		14.0%	86.0%	10.4 ----- 17.6	
Treatment	72.0%	28.0%	65.8 ----- 78.2		62.0%	38.0%	57.0 ----- 67.0	

level. Only item 7 and 18, in the northern group, exceed 40.0% of incorrect answers (Tab. IV).

Some significant differences among the information level of northern and southern teachers were observed. Items 2, 3, 4, 7, 9, 12, 15, 18, 19, 21 present significant differences ($p < 0.05$ and, in some cases, $p < 0.01$).

Those conclusions led to fixing Table VI, where data was summarized for the percentage of correct answers in chief sections regarding morphology, symptoms, prevention, and treatment. That is, instead of analyzing each item, all similar ones were aggregated. The aim of this was to understand whether some of the chief sections showed peculiar lack of information. Gender and cultural level of the teachers and students were considered versus the percentage of correct answers in each chief section and chi square tests were also computed to highlight the eventual association between the depicted variables. In the second part of the same table, intervals of confidence for the correct percentages of given answers in each chief section were computed. The evidence showed that teachers had higher CI for correct answers than students apart from the morphology section (55.3-68.7% versus 67.3-76.6%) this difference having to be considered in relation to the fact that the questionnaires presented easier questions for students regarding this section. In most of the cases, teachers showed a low or sufficient information level, starting from 55.3% (morphology) to 88.3% (symptoms). Students had a very weak information level especially referring to prevention area (10.4-17.6%) demonstrating a low or sufficient level of knowledge regarding the other areas, starting from 57.0% (treatment) to 80.2% (symptoms).

Concerning the first part of Table VI, the chi square test performed gave significant results, thus confirming a statistical association between cultural level, gender, geographical position both for students and teachers ($p < 0.01$ and $p < 0.05$) in relation to morphology and treatment areas. Concerning symptoms, significant results were only associated with students ($p < 0.01$) while the teachers' level of information did not result in being associated with geographical position and gender, regarding symptoms. The information level for preven-

tion area seemed just to be associated with gender and geographical position, both for students and teachers ($p < 0.05$), but not with cultural level ($p = ns$).

Specifically, the prevention area really needs to be tuned in such a way as to significantly increase the students' information level. They, in fact, were convinced that there were some shampoos on the market able to remove the eggs (81.0% and 74.0%) and products to prevent infestations (86.0% and 89.0%). Most of the students assumed that the problem of louse can be resolved by washing personal belongings at a "high" temperature. Some adjustment could be implemented referring to the treatment area.

Concerning the teachers' chief sections, the statistical evidence showed that some areas presented margins for improvement. Symptoms seem not to be much acknowledged, and some problems arose from Prevention and Treatment. The teachers also think that treatment with a special shampoo allows the removal of lice eggs (74.0%); this is false, because to be successful, manual removal is required. As well as in the students' answers there was the mistaken belief that there were products to prevent infestation (95.0%). In Veneto it was found that most of the teachers (57.0%) were convinced that the louse is able to pass from one person to another by air, probably as a jumping flea. In Sicily, on the contrary, teachers think quite correctly (over 71.0%) that the louse can switch to another head by contact of the scalps. It is important to note that 90.0% and 87.0% of teachers mistakenly believed that the National Health Service should carry out checks in schools at the request of the Head Teacher or that the check is a duty of the teaching staff (question 17).

Data about the sources of information were shown in Table VII. It was evident that, in the case of teachers, information was obtained from scattered sources, mainly obtained by magazines (12.1% north, 9.9% south), personal curiosity (11.0% north, 15.8% south) and internet availability (17.5% north, 23.3% south). Ministry of Health guidelines are a good source of information (24.3% north, 20.3% south) and school courses too (16.0% north, 9.9% south). Concerning students, the family was the reference point for the students, both in the north and in the south of Italy (86.2% versus 85.9%).

Tab. VII. Sources of information drawn on by teachers and students.

Source of information	Teachers				Students				Total	
	North	%	South	%	North	%	South	%	N	%
School courses	33	16.0	20	9.9	0	0.0	0	0.0	53	4.7
Magazines	25	12.1	20	9.9	0	0.0	0	0.0	45	4.0
Radio/TV	20	9.7	25	12.4	0	0.0	0	0.0	45	4.0
Specific papers	19	9.2	17	8.4	0	0.0	0	0.0	36	3.2
Ministry health guidelines	50	24.3	41	20.3	0	0.0	0	0.0	91	8.1
Internet	36	17.5	47	23.3	25	7.1	21	5.7	129	11.4
Personal researches	23	11.0	32	15.8	24	6.8	31	8.4	110	9.7
Family	0	0.0	0	0.0	305	86.2	316	85.9	621	55.0
Total	206	100.0	202	100.0	354	100.0	368	100.0	1130	100.0

Discussion

Although rated as a low priority health problem, pediculosis *is* a public health problem. The most relevant effects of pediculosis are social. Social knowledge, beliefs and perceptions largely influence success in correct management and treatment. Consequently, factors such as socio-economic and cultural status determine peoples' behavior when facing the infestation [20, 23, 24]. Beliefs and lack of information mean that pediculosis is almost always incorrectly treated at all levels (teachers, families and students) and with no scientific action. In the literature, most of the reports deal with prevalence and treatment of pediculosis. Little work has been performed to evaluate knowledge, beliefs and perceptions regarding head lice in teachers and families. Results obtained in this paper seem to contribute significant information about the level of knowledge and perceptions on head lice infestation in the sample of teachers and students surveyed. As far as the teachers are concerned, in particular, the chief sections of Symptoms and Treatment of pediculosis can be considered insufficient, while the Morphology and Prevention sections have very critical level of information. Results reported in the distribution of percentages of correct answers provided by northern and southern teachers, moreover, showed that they had differences in the knowledge of the various item proposed. In particular, there was a slight prevalence of correct answers from southern teachers, probably because the phenomenon of pediculosis has a positive trend of growth in the south, while it is slightly decreasing in the north. The knowledge of the phenomenon derived fundamentally from teachers' personal experiences. The percentage of teachers who give priority to official sources of information (Ministry of Health guidelines and school courses) is not as high as it should be. Among the teachers very few, had some knowledge related to training/information in official courses offered by the School. About three quarters of teachers, if requested, said they would like more information on how to prevent head lice infestation [25].

Students, on the other hand, have the family as a reference point and collect information mainly within the family. Parents, however, as reported by other Authors [27, 28] are not prepared to manage the infestation. Families generally give some sort of incomplete information and are prevalently concerned with how to preserve social image of the family. The perceived damage of a family's social image lead in almost all cases to an overuse of pediculicides, the effect of which is to increase resistance to the substances used for the treatment [34]. Childrens' level of knowledge is clearly dependent on the parents and teachers, and teachers need to know how to inform them. The number of correct answers was, for all of the teachers, on average 60.0%; a negative result in itself, considering the simplicity and fairness of some questions. Knowledge of the biology of the louse was virtually absent, and teachers showed no clear ideas about this topic. Prevention mainly, showed

a big information gap as most of the teachers (72.0%, in Veneto and 63.0% in Sicily) believe that there are shampoos that can prevent infestation by louse. Faith and trust in some kind of possible preventive action, went up to 95.0% in the minds of Sicilian teachers. This specific false belief is the one that particularly increases the incorrect overuse of pediculicides, which, in turn, increases resistance to treatment. False perceptions and convictions that consider the louse to be a vector of some kinds of infections, produces again as a consequence, the active and inevitable overuse of pediculicides, useless for the prevention of infestation.

Deficiencies in teachers' information and beliefs of the family lead to lack of correct information in children. Cultural level of the families, on the contrary, seems directly correlated with knowledge and correct actions. It was shown, in fact, that an increasing cultural level, increases the number of correct answers among the students. Data obtained supports the reported decrease of prevalence in families with a higher educational level [27]. Coherent behavior was also reported, with regard to the correct use of pediculicides, given only when treatment is necessary.

The no-nit policies and closure for disinfestation when head louse "epidemics" occur, moreover, bring about a loss of school days. The reported proportion of children missing school is alarming [28]. Negative consequences and inconveniences are fully experienced by working parents. No results are obtained in the field of prevention.

Given this scenario, however, educational intervention seems to be absolutely necessary. Consequently it also seems necessary to emphasize the role that the School as educational Agency must play in increasing the level of correct knowledge on this matter. School-based intervention of health education programs are strongly requested and considered fundamental in developing a rooted culture and knowledge on different topics. Schools, however, need to have evidence and reference data on methods and suitable strategies and must be sustained with both human and material resources.

Results presented in this work, have great limits and cannot be considered exhaustive because: answers may have been subjected to reporting bias; data may not be applicable to individuals of geographic areas different from those taken into consideration; investigation would need to be repeated to monitor the attitude of the scholastic population, either regarding students or teachers, toward prevention and behavior in lice infestation. Further research is then required to determine the most favorable programs or courses a school can propose, optimal length of time and appropriate evaluation of long term effectiveness of the acquired knowledge.

In conclusion, to control pediculosis at school the only effective action seems to be to act simultaneously on the core Family/School providing health education intervention on specific topic [35]. Increased training opportunities for teachers and correct information for

the families and, as a consequence, for students, may allow [36, 37] correct understanding of pediculosis, appropriate use, and only when necessary, of pediculicides. This would increase also the teachers' competence and,

consequently, as soon as the infestation should manifest, a rapid alert of the Health Service so that proper advice and suggestion for treatment could be provided by medical personnel.

References

- [1] Chosidow O. *Scabies and pediculosis*. Lancet 2000;355:819-26.
- [2] Gillis D, Slepon R, Karsenty E, Green M. *Seasonality and long-term trends of the pediculosis capitis and pubis in a young adult population*. Arch Dermatol 1990;126:638-41.
- [3] Frankowski BL. *Head lice*. Pediatrics 2002;110:638-43.
- [4] Ioli A. *Un modello di studio parassitologico della popolazione scolastica di una USL della Sicilia [A parassitological study model of a scholastic population in a local health department of Sicily]*. Igiene San Publ 1990;46:81-7.
- [5] Bollettino Epidemiologico Nazionale. *Pediculosis*. Notiziario ISS 2001;14:26-7.
- [6] Weir E. *School's back, and so is the lowly louse*. JAMA 2001;18:165-72.
- [7] Roberts RJ, Casey D, Morgan DA. *Comparison of wet combing with malathion for treatment of head lice in the UK: a pragmatic randomised controlled trial*. Lancet 2000;356:540-4.
- [8] Ramirez A, Luduena Almeda FF, Almiron WR. *Prevalence of pediculus humanus capitis infestation in schoolchildren at Despenaderos, Cordoba*. Rev Fac Cien Med Univ Nac Cordoba 2003;60:43-9.
- [9] Buczek A, Kawa IM, Markowska-Gosik D, Widomska D. *Pediculosis in rural school of Lublin Province*. Wiad Parazytol 2001;47:359-64.
- [10] Buczek A, Markowska-Gosik D, Widomska D, Kawa IM. *Pediculosis capitis among schoolchildren in urban and rural areas of eastern Poland*. Eur J Epidemiol 2004;19:591-5.
- [11] Mimouni D, Ancol OE, Gdalevich M, Grotto I, Davidovitch N, Zangvil E. *Seasonality trends of pediculosis capitis and phthirus pubis in a young adult population: follow-up of 20 years*. Eur Acad Dermatol Venerol 2002;16:257-9.
- [12] Kamiabi F, Nakhaei FH. *Prevalence of pediculosis capitis and determination of risk factors in primary schoolchildren in Kerman*. East Mediterr J 2005;11:988-92.
- [13] Català S, Junco I, Vaporaky R. *Pediculus capitis infestation according to sex and social factors in Argentina*. Rev Saude Publica 2005;39:438-43.
- [14] Speare R, Buettner PG. *Head lice in pupils of a primary school in Australia and implication for control*. Int J Dermatol 1999;38:285-90.
- [15] Counahan M, Andrews R, Buttner P, Byrnes G, Speare R. *Head lice prevalence in primary schools in Victoria, Australia*. J Paediatr Child Health 2004;40:616-9.
- [16] Khokhar A. *A study of pediculus capitis among primary schoolchildren in Delhi*. Indian J Med Sci 2002;56:449-52.
- [17] Hansen RC. *Overview: the state of head lice management and control*. Am J Manag Care 2004;10:260-3.
- [18] Heukelbach J, Wilcke T, Winter B, Feldmeier H. *Epidemiology and morbidity of scabies and pediculosis capitis in resource-poor communities in Brazil*. Br J Dermatol 2005;153:150-6.
- [19] Sim S, Lee I, Seo JH, IM KI, Shin MH, Yong TS. *A survey on head lice infestation in Korea (2001) and therapeutic efficacy of oral trimethoprim/ sulfamethoxazole adding to lindane shampoo*. Korean J Parasitol 2003;41:57-61.
- [20] Nazari M, Fakoorziba MR, Shobein F. *Pediculus capitis infestation according to sex and social factors in Hamedan, Iran*. Southeast Asian J Trop Med Public Health 2006;37:95-8.
- [21] Kokturk A, Baz K, Bugdayci R, Sasmaz T, Tursen U, Kaya TI, et al. *The prevalence of pediculosis capitis in schoolchildren in Mersin, Turkey*. Int J Dermatol 2003;42:694-8.
- [22] Menan EL, N'Guessan G, Kiki-Barro PC. *Scalp pediculosis in school environment in the city of Abidjan: prevalence and influence of socioeconomic conditions*. Santè 1999;9:32-7.
- [23] Fasulo TR, Kern W, Koehler PG, Short DE. *Pests In and Around the Home*. Version 2.0. University of Florida/IFAS. CD-ROM. SW 126, 2005.
- [24] Willems S, Lapeere H, Haedens N, Pasteels S, Naeyaert JM, De Maeseneer J. *The importance of socio-economic status and individual characteristics on the prevalence of head lice in schoolchildren*. Eur J Dermatol 2005;15:387-92.
- [25] Kirchofer GM, Price JH, Telliohann SK. *Primary grade teachers' knowledge and perceptions of head lice*. J Sch Health 2001;71:448-52.
- [26] Price JH, Burkhart CN, Burkhart CG, Islam R. *School nurses' perceptions of and experiences with head lice*. J Sch Health 1999;69:153-8.
- [27] Silva L, Alencar Rde A, Madeira NG. *Survey assessment of parental perceptions regarding head lice*. Int J Dermatol 2008;47:249-55.
- [28] Counahan ML, Andrews RM, Weld H, Helen W, Speare R. *What parents in Australia know and do about head lice*. Rural Remote Health 2007;7:687-700.
- [29] Malizia G, Pieroni V. *L'Educazione alla Salute nella scuola dell'autonomia. Un'indagine a Roma e Provincia [Health Education in the school of autonomy. An investigation in Rome and Province]*. Milano: Franco Angeli 1999; pp. 1-352.
- [30] Curtiade C, Labreze C, Fontan I, Taieb A, Maleville J. *Pediculus capitis: a questionnaire survey in 4 schools of the Bordeaux Academy 1990-1991*. Ann Dermatol Venereol 1993;120:363-8.
- [31] Mumcuoglu KY, Miller R, Gorn B, Adler F, Ben-Ishai R, Almog D, et al. *Head lice in Israeli children: parents' answers to an epidemiological questionnaire*. Public Health Review 1990;18:335-44.
- [32] Bonura F. *Pediculosis in Schools: educational intervention on prevention and health promotion*. [dissertation] Palermo: University of Palermo 2006, pp. 1-146.
- [33] Trimarchi M. *Pediculosis: perception, knowledge and influence of socioeconomic factors in a Primary School of Palermo, Sicily*. [dissertation] Palermo: University of Palermo 2007; pp. 1-134.
- [34] Pollack RJ. *Overdiagnosis and consequent mismanagement of head louse infestations in North America*. Pediatr Infect Dis 2000;19:689-93.
- [35] Pellai A, Marzorati P. *Educazione alla Salute: standard e linee guida dalla scuola elementare alla scuola superiore [Health Education: standard and guidelines from primary school to secondary school]*. Milano: Franco Angeli 2002, pp. 1-256.
- [36] Donnelly E. *Pediculosis prevention and control strategies of community health and school nurses: a descriptive study*. J Commun Health Nurs 1991;8:85-95.
- [37] Williams K. *Lice, nits and school policy*. Pediatrics 2001;107:1011-5.

QUESTIONNAIRE FOR TEACHERS

- 1 What are lice?**
 - ☐ A spiders
 - ☐ B insects
 - ☐ C crustaceans
- 2 Lice belong to the order of...?**
 - ☐ A acarina
 - ☐ B anoplura
 - ☐ C diptera
- 3 The louse has..:**
 - ☐ A 2 pairs of legs
 - ☐ B 3 pairs of legs
 - ☐ C 4 pairs of legs
- 4 Lice are transmitted ...:**
 - ☐ A with feces
 - ☐ B only by contact of the scalp
 - ☐ C by air
- 5 Lice infest...:**
 - ☐ A only scalp
 - ☐ B different parts of the body
 - ☐ C cutaneous orifices
- 6 Pediculosis...:**
 - ☐ A is a persistent infestation
 - ☐ B is a chronic infestation
 - ☐ C is a transitory infestation
- 7 Treatment consists...:**
 - ☐ A antibiotic
 - ☐ B DDT
 - ☐ C permethrin 1%
- 8 How to treat...:**
 - ☐ A a specific product on day 0 and 7 and taking off the eggs
 - ☐ B apply a decoction of winegar and origanum
 - ☐ C apply different products every seven days
- 9 In case of pediculosis:**
 - ☐ A all the family is infested
 - ☐ B only the boy is infested
 - ☐ C pets are the vectors
- 10 Lice:**
 - ☐ A prefer poor surroundings
 - ☐ B prefer rich surroundings
 - ☐ C do not have preferences
- 11 Lice:**
 - ☐ A do not infest clean hair
 - ☐ B infest only dirty hair
 - ☐ C infest without distinction dirty and clean hair
- 12 One can notice lice in children...:**
 - ☐ A they scratch their head
 - ☐ B because of the desquamation of the scalp
 - ☐ C visualizing eggs
- 13 Do it exists a preventive product...?**
 - ☐ A yes, you can buy it in the drugstore
 - ☐ B yes, but you need a prescription
 - ☐ C no, do not exists
- 14 Shampoo:**
 - ☐ A eliminates all lice
 - ☐ B eliminates only eggs
 - ☐ C eliminates lice and eggs
- 15 In case of pediculosis at school:**
 - ☐ A the boy must remains at home
 - ☐ B school should be closed for disinfection
 - ☐ C the student should be adequately treated
- 16 Information in case of pediculosis at school should be provided...:**
 - ☐ A by local Sanitary Services
 - ☐ B by the teacher in charge of the health education
 - ☐ C by the dermatologist
- 17 Sanitary Services suspended periodic controls in the schools:**
 - ☐ A because were considered useless
 - ☐ B because visit must be requested by the school manager
 - ☐ C because is a duty of the teaching staff
- 18 To be readmitted at school in case of pediculosis:**
 - ☐ A a medical certificate is needed
 - ☐ B usual procedure is sufficient
 - ☐ C student should be taken to school by parents
- 19 Personal belongings ...:**
 - ☐ A should be exposed to sun rays for one day
 - ☐ B should be washed with temperature over 60 degrees
 - ☐ C do not need any particular treatment
- 20 Clothes of infested individual...:**
 - ☐ A should be sterilized by Sanitary Services
 - ☐ B can be washed at home
 - ☐ C should be burnt
- 21 There are specific methods for prevention...?**
 - ☐ A yes, using specific products
 - ☐ B yes, but people must be informed
 - ☐ C no, there are no methods of effective value

QUESTIONNAIRE FOR CHILDREN

Do you know lice?

1 The louse is...:

- ☐ A spider
- ☐ B insect
- ☐ C crustacean

2 The louse has...:

- ☐ A 2 pairs of legs
- ☐ B 3 pairs of legs
- ☐ C 4 pairs of legs

3 Lice...:

- ☐ A make hair falling out
- ☐ B produce itching
- ☐ C produce tiredness and inappetence

4 Lice are transmitted...:

- ☐ A with feces
- ☐ B only by contact of the scalp
- ☐ C by air

5 The louse infests...:

- ☐ A only scalp
- ☐ B different parts of the body
- ☐ C cutaneous orifices

6 If a classmate gets lice.....:

- ☐ A should remain at home
- ☐ B school must be closed
- ☐ C an adequate treatment should be requested

7 Lice can be found...:

- ☐ A only in places of ill repute
- ☐ B only in the hairdresser
- ☐ C in every environment

8 Lice...:

- ☐ A do not infest clean hair
- ☐ B infest only dirty hair
- ☐ C infest without distinction dirty and clean hair

9 Lice are associated...:

- ☐ A prefer poor surroundings
- ☐ B prefer rich surroundings
- ☐ C do not have preferences

10 How to eliminate lice...?

- ☐ A with a hair gel
- ☐ B using antibiotic
- ☐ C with a specific product when lice/eggs are seen

11 Are there preventive products...?

- ☐ A yes, you can buy it in the drugstore
- ☐ B yes, but you need a prescription
- ☐ C no, do not exist

12 Shampoo...:

- ☐ A eliminates all lice
- ☐ B eliminates only eggs
- ☐ C eliminates lice and eggs

13 Clothes of someone with lice...:

- ☐ A should be sterilized by Sanitary Services
- ☐ B can be washed at home
- ☐ C should be burnt

14 Personal belongings...:

- ☐ A should be exposed to sun rays for one day
- ☐ B should be washed at a temperature over 60 degrees C°
- ☐ C do not need any particular treatment

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