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BMJ Paediatrics Open**Nocturnal enuresis in children from Santo Domingo,
Dominican Republic; Prevalence and associated risk factors**

Journal:	<i>BMJ Paediatrics Open</i>
Manuscript ID	bmjpo-2018-000311
Article Type:	Original article
Date Submitted by the Author:	12-May-2018
Complete List of Authors:	Mejias, Stephanie; Hospital Infantil Robert Reid Cabral, Department of Pediatrics Ramphul, Kamleshum; Shanghai Jiaotong University School of Medicine Xinhua Hospital,
Keywords:	Enuresis

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Review Only

Nocturnal enuresis in children from Santo Domingo, Dominican Republic; Prevalence and associated risk factors

What is already known on this topic?

Nocturnal enuresis is a common condition seen in many young children of different races and cultures.

Recent studies have shown that enuresis is a multifactorial condition based on organic causes as well as genetic risk factors.

The prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet unknown.

What this study hopes to add?

The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported studies from Congo (26%) and Nigeria (21.3%).

Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males (26.5%).

Age, deep sleep and family history of enuresis were strongly associated with nocturnal enuresis.

INTRODUCTION

Nocturnal enuresis is a common condition seen in many young children.(1) It is defined as bedwetting in a child with no prior history of congenital urogenital defect or acquired defect after the age of 5.(2) This condition can be distressing for both the child and the parents concerned. It has been acknowledged as a benign condition with multifactorial causes present in different

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2
3 cultures and races. Some studies have suggested that the physiology of sleep, hormonal levels
4 such as antidiuretic hormones, electrolytes levels of sodium and potassium and the physiology of
5 the bladder are all potential factors responsible for the pathophysiology of this condition.(3, 4)
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10 There have been multiple studies that were carried out for different countries and cultures but the
11 prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet
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15 unknown.

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18 The main goal of this study was to determine the prevalence of nocturnal enuresis in Dominican
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The main goal of this study was to determine the prevalence of nocturnal enuresis in Dominican
Republic and to identify any associated risk factors. This will allow parents to better understand
and prevent the recurrence of nocturnal enuresis. Proper counseling, education and information
can be done following this study.

MATERIALS AND METHODS

Study design and participants

A cross sectional study was conducted among children attending primary schools in Santo Domingo, Dominican Republic from November 2017 to December 2017. The study population was randomly selected to include children aging from 5 to 11, from different social strata among different schools in Santo Domingo, Dominican Republic.

A questionnaire was designed to help detect children with nocturnal enuresis and different risk factors. It was prepared in English and translated into Spanish (predominant language in Santo Domingo). The questionnaire was assessed for content validity and modified accordingly by several experts. Appropriate drafting and editing was done and the final version was pilot tested with a small batch of 100 students. The questionnaires were sent to be filled by the parents and data collection in all schools was performed with the help of the Dean and teachers. Parents were

also advised to keep a sleep journal for the children to improve accuracy of the data. A contact number was included to answer any questions the parents had while undertaking the questionnaire.

A total of 682 questionnaires were returned and 655 fully filled questionnaires were considered for the study. Children were then further divided into different age groups namely: 5 to 7, 7 to 9 and 9 to 11 years of age. The questionnaire consisted of a set of 22 questions involving age, sex, order in the family, presence of deep sleep, history of constipation, family history of nocturnal enuresis, breastfeeding history and management of the condition by parents.

Statistical analysis

Data were analyzed using SPSS version 24.0 (SPSS Inc, Chicago, Illinois, USA) for windows and Chi square test was used to study the associations between categorical variables. Differences were considered significant when $p < 0.05$.

Ethical clearance was granted by the schools' boards of ethics and written consent was obtained from the parents as well as assent from the children. Confidentiality of all participants was respected.

RESULTS

Out of 700 questionnaires distributed among the schools, 682 were returned with a response rate of 97.4%. After meticulous selection 655 fully-filled questionnaires were considered for this study. 27 questionnaires were excluded as they were not completely filled. Out of the 655 children, 332(50.7%) were boys and 323(49.3%) were girls. 183 children were diagnosed with nocturnal enuresis during this study with a prevalence rate of 26.5% in males, 29.4% in females and the overall prevalence was 27.9%. No statistical significance was found between gender and

nocturnal enuresis ($p=0.407$). 152 children (83.0%) were identified with primary enuresis among which 75(49.3%) were boys and 77(50.7%) were girls. Secondary enuresis was present in 31 children; 13 (41.9%) boys and 18(58.1%) girls.

The frequency of enuresis was further subdivided into 3 age groups. 86 children between 5 to 7 years of age, 65 children between 7 to 9 years of age, and 32 children between 9 to 11 years of age, were diagnosed with nocturnal enuresis as shown in table 1. Statistical significance was found between age and nocturnal enuresis with $p<0.001$. 163 children (89.0%) who had enuresis did not seek medical help for their condition. The parents opted for self-help strategies among which 134 (82.2%) restricted fluid intake in the child at least 1 hour before bedtime and 122(74.9%) parents woke up the child to empty their bladder. 20 children(11%) sought help from a doctor and 3 children needed further evaluation(0.0164%).

It was also observed that 83 first children were diagnosed with nocturnal enuresis and the order in the family showed no statistical significance ($p=0.058$). The presence of deep sleep was found in 121 of the 183 enuretic children and it was statistically significant ($p<0.01$). Constipation and enuresis were both present in 38 children and 133 children who were breastfed up to at least 4 months were enuretic. Both of these findings showed no statistical significance with $p>0.05$ (table 1).

Statistical significance between paternal history, maternal history and nocturnal enuresis was found in this study. 140 children with enuresis had a paternal history of enuresis and 133 children had a maternal history. (table1)

DISCUSSION

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3 This is the first study done in Santo Domingo, Dominican Republic to determine the prevalence
4 of nocturnal enuresis among children aged 5 to 11. The prevalence of nocturnal enuresis was
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6 27.9% and it is in accordance with reported studies from Congo (26%)(5) and Nigeria (21.3%)(6)
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8 but slightly higher in comparison with India (12.6 %)(7) , Finland (8.2%)(8) and Bangkok
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10 (3.9%) (9) . The prevalence in this study was lower than Morocco (35.0%)(10) and Jamaica
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12 (50%) (11). The differences can be attributed to different sample sizes and selection criteria in
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14 terms of age and definition of nocturnal enuresis. It also shows that nocturnal enuresis has a
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16 multifactorial genetic predisposition.
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22 Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males(26.5%)
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24 with similar results being reported in Congo(5) ,Turkey(12) and Thailand(9) . The prevalence
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26 of enuresis in this study decreased with increasing age and a statistical significance confirmed
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28 the findings of multiple studies.(5, 13-15) Breastfeeding is considered important for the first 4
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30 months of life but no statistical significance was found in this study which is in accordance with
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32 Gumus et al(12) . Singh et al(16) found a higher prevalence of enuresis in children who were not
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34 breastfed during the first 4 months of life. There was however no control group in their study and
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36 further studies should be carried out to understand the relationship between breastfeeding and
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38 enuresis.
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43 Presence of an enuresis history in the child's father or mother has often been associated with a
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45 higher risk of enuresis in the child (17-19) and a similar conclusion was reached in this study.
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47 Previous study has shown that regions on chromosomes 8, 12 and 13 were associated with a
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49 higher risk of nocturnal enuresis in the child.(20) Deep sleep has been linked with nocturnal
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51 enuresis in this study and similar findings were reported (5) . However proper sleep studies
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53 should be performed as suggested by Yeung et al.(21)
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3 In this study, only 11% of the children sought medical help to evaluate their problem. Prevention
4 measures adopted by parents who did not seek medical attention included fluid restriction at least
5 one hour before sleep (82.2%) and waking the child up to empty their bladder (74.8%). Families
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7 in Australia mostly opted for fluid restriction whereas in the US and New Zealand the majority
8
9 woke their children up to void their bladder.(22, 23)
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15 Despite some limitations, the current study is the first to investigate the prevalence of nocturnal
16 enuresis in children from Santo Domingo, Dominican Republic. A broader study in the
17 population of Dominican Republic through different cities will be helpful to identify children
18 who are at risk for severe enuresis and proper education and prevention can be provided to
19 parents to better help the children concerned.
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26

27 **Acknowledgements**

28 The authors would like to thank all the parents and children who participated in the study and the
29 deans and teachers who helped in collecting the data.
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35 **Contributors:** MSG, the corresponding author, contributed in collecting the data, organizing the
36 study and takes final responsibility for the decision to submit for publication. RK was involved
37 in the setup of the study, the statistical analysis of the data, the writing of the article.
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43 **Funding:** This research received no specific grant from any funding agency in the public,
44 commercial or not-for-profit sectors
45

46 **Competing interests:** None declared.
47

48 **Patient consent:** Parental/guardian consent obtained for each questionnaire.
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50 **Ethics approval:** The ethics committee of each school read and approved the research.
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53 **Provenance and peer review:** Not commissioned; externally peer reviewed.
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Data sharing statement: All the data in the study are available to researchers via a data request to the corresponding author.

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Table 2. Prevalence and factors associated with nocturnal enuresis in children from Santo Domingo, Dominican Republic.

	Enuretic	Non Enuretic	p- value
Sex			
Male	88	244	0.407
Female	95	228	
Age			
5-7	86	139	<0.001
7-9	65	157	
9-11	32	176	
First Child			
Yes	83	253	0.058
No	100	219	
Deep Sleep			
Yes	121	146	<0.001
No	62	326	
Constipation			
Present	38	123	0.158
Absent	145	349	
Family History			
Paternal			
Present	140	109	<0.001
Absent	43	363	
Maternal			
Present	133	123	<0.001
Absent	50	349	
Breastfeeding up to age of 4 months			
Present	133	326	0.365
Absent	50	146	

BMJ Paediatrics Open**Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire study of prevalence and risk factors**

Journal:	<i>BMJ Paediatrics Open</i>
Manuscript ID	bmjpo-2018-000311.R1
Article Type:	Original article
Date Submitted by the Author:	05-Jun-2018
Complete List of Authors:	Mejias, Stephanie; Hospital Infantil Robert Reid Cabral, Department of Pediatrics Ramphul, Kamleshun; Shanghai Jiaotong University School of Medicine Xinhua Hospital,
Keywords:	Enuresis

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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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32 Dr Mejias contributed in collecting the data and organizing the study.
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35 Dr Ramphul was involved in the setup of the study, the statistical analysis of the data, the writing
36 of the article.
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40 *Both authors contributed equally to the study.
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44 **Short running title:** Nocturnal enuresis in Santo Domingo
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47 Word count: 1835 (main article) , Table:1 Figures: 0
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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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8 **Abstract:**
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11 Objective: To determine the prevalence of pediatric nocturnal enuresis in Santo Domingo,
12 Dominican Republic.
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16 Design: A cross-sectional study was performed using a pretested questionnaire.
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20 Setting: Different schools in Santo Domingo, Dominican Republic
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23 Participants: 700 children aged 5-11 years attending one of the different schools in Santo
24 Domingo, Dominican Republic.
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28 Intervention: The study was carried out from November 2017 to December 2017.
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31 Main outcome measures: The prevalence of nocturnal enuresis was close to reported values in
32 Congo and Nigeria but slightly higher in comparison to India, Finland and Bangkok.
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36 Results: 700 questionnaires were sent to be filled and 682 were returned. 655 fully filled
37 questionnaires met the requirements of the study. 183 children (27.9%) were identified with
38 nocturnal enuresis among which 88 were boys and 95 were girls. No statistical significance was
39 found between gender, order in the family, constipation and breastfeeding ($p>0.05$). Age, deep
40 sleep and family history of enuresis were strongly associated with nocturnal enuresis.
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49 Conclusions: The prevalence of nocturnal enuresis in Santo Domingo was found to be 27.9% and
50 it was higher compared to some Asian countries but lower than Morocco and Jamaica. Only 11%
51 of children with enuresis sought medical help. Nocturnal enuresis is an important problem in the
52 pediatric population of Santo Domingo and proper education and sensitization can help.
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What is already known on this topic?

Nocturnal enuresis is a common condition seen in many young children of different races and cultures.

Recent studies have shown that enuresis is a multifactorial condition based on organic causes as well as genetic risk factors.

The prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet unknown.

What this study hopes to add?

The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported studies from Congo (26%) and Nigeria (21.3%).

Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males (26.5%).

Age, deep sleep and family history of enuresis were strongly associated with nocturnal enuresis

INTRODUCTION

Nocturnal enuresis is a common condition seen in many young children.(1) It is defined as bedwetting in a child with no prior history of congenital urogenital defect or acquired defect after the age of 5.(2) This condition can be distressing for both the child and the parents concerned. It has been acknowledged as a benign condition with multifactorial causes present in different cultures and races. Some studies have suggested that the physiology of sleep, hormonal levels such as antidiuretic hormones, electrolytes levels of sodium and potassium and the physiology of the bladder are all potential factors responsible for the pathophysiology of this condition.(3, 4) There have been multiple studies that were carried out for different countries and cultures but the prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet unknown.

The main goal of this study was to determine the prevalence of nocturnal enuresis in Dominican Republic and to identify any associated risk factors. Since health care in Dominican Republic is not free, the questionnaire also investigated if the cost of treatment was an important factor for refusing medical help in children with enuresis. The outcome of this study will allow both parents and the health institutions to understand the prevalence of nocturnal enuresis in Santo Domingo and provide better solutions for the treatment and cost of treatment of children. Proper counseling, education and information can also be done following this study.

MATERIALS AND METHODS

Study design and participants

A cross sectional study was conducted among children attending primary schools in Santo Domingo, Dominican Republic from November 2017 to December 2017. The study population

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2
3 was randomly selected to include children aging from 5 to 11, from different social strata among
4
5 different schools in Santo Domingo, Dominican Republic.
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8 A questionnaire was designed to help detect children with nocturnal enuresis and different risk
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10 factors. It was first prepared in English and then translated into Spanish (predominant language
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12 in Santo Domingo). The questionnaire was assessed for content validity and modified
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14 accordingly by several experts. Appropriate drafting and editing was done and the final version
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16 was pilot tested with a small batch of 100 students. The questionnaires were sent to be filled by
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18 the parents and data collection in all schools was performed with the help of the Dean and
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20 teachers. Parents were also advised to keep a sleep journal for the children to improve accuracy
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22 of the data. A contact number was included to answer any questions the parents had while
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24 undertaking the questionnaire.
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29 A total of 682 questionnaires were returned and 655 fully filled questionnaires were considered
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31 for the study. Children were then further divided into different age groups namely: 5 to 7, 7 to 9
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33 and 9 to 11 years of age. The questionnaire consisted of a set of 22 questions involving age, sex,
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35 order in the family, presence of deep sleep, history of constipation, family history of nocturnal
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37 enuresis, breastfeeding history and management of the condition by parents.
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42 **Statistical analysis**

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45 Data were analyzed using SPSS version 24.0 (SPSS Inc, Chicago, Illinois, USA) for windows
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47 and Chi square test was used to study the associations between categorical variables. Differences
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49 were considered significant when $p < 0.05$.
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Ethical clearance was granted by the schools' boards of ethics and written consent was obtained from the parents as well as assent from the children. Confidentiality of all participants was respected.

RESULTS

Out of 700 questionnaires distributed among the schools, 682 were returned with a response rate of 97.4%. After meticulous selection 655 fully-filled questionnaires were considered for this study. 27 questionnaires were excluded as they were not completely filled. Out of the 655 children, 332(50.7%) were boys and 323(49.3%) were girls.

183 children (27.9%) were identified with primary enuresis among which 88 were boys and 95 were girls. The frequency of enuresis was further subdivided into 3 age groups. 86 children between 5 to 7 years of age, 65 children between 7 to 9 years of age, and 32 children between 9 to 11 years of age, were diagnosed with nocturnal enuresis. Statistical significance between age, paternal history, maternal history, deep sleep and nocturnal enuresis was found in this study as seen in table 1. Gender, order in the family, constipation and breastfeeding were not statistically relevant to nocturnal enuresis.

Table 1. Prevalence and factors associated with nocturnal enuresis in children from Santo Domingo, Dominican Republic.

	Enuretic	Non Enuretic	p- value
Sex			
Male	88	244	0.407
Female	95	228	
Age			
5-7	86	139	<0.001
7-9	65	157	
9-11	32	176	
First Child	83		0.058

Yes	100	253	
No		219	
Deep Sleep			
Yes	121	146	<0.001
No	62	326	
Constipation			
Present	38	123	0.158
Absent	145	349	
Family History			
Paternal			
Present	140	109	<0.001
Absent	43	363	
Maternal			
Present	133	123	<0.001
Absent	50	349	
Breastfeeding up to age of 4 months			
Present	133	326	0.365
Absent	50	146	

163 children (89.0%) who had enuresis did not seek medical help for their condition. The parents opted for self-help strategies among which 134 (82.2%) restricted fluid intake in the child at least 1 hour before bedtime and 122(74.9%) parents woke up the child to empty their bladder. 20 children(11%) sought help from a doctor and 3 children needed further evaluation.

DISCUSSION

This is the first study done in Santo Domingo, Dominican Republic to determine the prevalence of nocturnal enuresis among children aged 5 to 11. The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported studies from Congo (26%)(5) and Nigeria (21.3%)(6) but slightly higher in comparison with India (12.6 %)(7) , Finland (8.2%)(8) and Bangkok (3.9%) (9) . The prevalence in this study was lower than Morocco (35.0%)(10) and Jamaica

(50%) (11). The differences can be attributed to different sample sizes and selection criteria in terms of age and definition of nocturnal enuresis.

Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males(26.5%) with similar results being reported in Congo(5) ,Turkey(12) and Thailand(9) . The prevalence of enuresis in this study decreased with increasing age and a statistical significance confirmed the findings of multiple studies.(5, 13-15) Breastfeeding is considered important for the first 4 months of life but no statistical significance was found in this study which is in accordance with Gumus et al(12) . Singh et al(16) found a higher prevalence of enuresis in children who were not breastfed during the first 4 months of life. There was however no control group in their study and further studies should be carried out to understand the relationship between breastfeeding and enuresis.

Presence of an enuresis history on the maternal or paternal side has often been associated with a higher risk of enuresis in the child (17-19) and a similar conclusion was reached in this study. Previous study has shown that regions on chromosomes 8, 12 and 13 were associated with a higher risk of nocturnal enuresis in the child.(20) Deep sleep has been linked with nocturnal enuresis in this study and similar findings were reported.(5) However proper sleep studies should be performed as suggested by Yeung et al.(21)

Health care in Dominican Republic is not free and easily accessible to everyone. 83 parents (51%) admitted that the cost of medical treatment was the main reason for avoiding any medical help. The management of nocturnal enuresis in Dominican Republic involves several steps. A pretreatment evaluation is done by the physician to rule out any history that could raise concern. The initial treatment includes reassurance and starting a diary to monitor fluid intake at night, frequency of bedwetting and any encopresis. In some cases, the parents have to be properly

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3 educated that the children are not to be blamed and they should not be punished for bedwetting.
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5 Bedwetting alarms are also used in cases of frequent bedwetting and the progress is evaluated by
6
7 the physician. This usually requires regular follow-ups and in some cases, a psychological
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9 evaluation to rule out any event that might be contributing to the condition is also done. In severe
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11 and persistent cases, the physician might consider the use of drugs such as desmopressin.
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13 However, their use is not common in Santo Domingo for mild to moderate cases.
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18 The study found out that 20 (11%) children sought medical help and only 3 children have not
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20 responded to bedwetting alarms. Prevention measures adopted by parents who did not seek
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22 medical attention included fluid restriction at least one hour before sleep (82.2%) and waking the
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26 whereas in the US and New Zealand the majority woke their children up to void their bladder.(22,
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28 23)
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33 Despite some limitations, the current study is the first to investigate the prevalence of nocturnal
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35 enuresis in children from Santo Domingo, Dominican Republic. A broader study in the
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37 population of Dominican Republic through different cities will be helpful to identify children
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41 parents to better help the children concerned.
42
43

44 **Acknowledgements**

45
46 The authors would like to thank all the parents and children who participated in the study and the
47
48 deans and teachers who helped in collecting the data.
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Contributors: MSG, the corresponding author, contributed in collecting the data, organizing the study and takes final responsibility for the decision to submit for publication. RK was involved in the setup of the study, the statistical analysis of the data and writing of the article.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Competing interests: None declared.

Patient consent: Parental/guardian consent obtained for each questionnaire.

Ethics approval: The ethics committee of each school read and approved the research.

Provenance and peer review: Not commissioned; externally peer reviewed.

Data sharing statement: All the data in the study are available to researchers via a data request to the corresponding author.

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BMJ Paediatrics Open**Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire study of prevalence and risk factors**

Journal:	<i>BMJ Paediatrics Open</i>
Manuscript ID	bmjpo-2018-000311.R2
Article Type:	Original article
Date Submitted by the Author:	06-Jul-2018
Complete List of Authors:	Mejias, Stephanie; Hospital Infantil Robert Reid Cabral, Department of Pediatrics Ramphul, Kamleshun; Shanghai Jiaotong University School of Medicine Xinhua Hospital,
Keywords:	Enuresis

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Manuscripts

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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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33
34 Dr Mejias contributed in collecting the data and organizing the study.
35

36
37 Dr Ramphul was involved in the setup of the study, the statistical analysis of the data, the writing
38 of the article.
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42 *Both authors contributed equally to the study.
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45 **Short running title:** Nocturnal enuresis in Santo Domingo
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48 Word count: 1946 (main article) , Table:1 Figures: 0
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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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8 **Abstract:**
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11 Objective: To determine the prevalence of pediatric nocturnal enuresis in Santo Domingo,
12 Dominican Republic.
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16 Design: A cross-sectional study was performed using a pretested questionnaire.
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20 Setting: Three different schools in Santo Domingo, Dominican Republic
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23 Participants: 700 children aged 5-11 years attending one of the different schools in Santo
24 Domingo, Dominican Republic.
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28 Intervention: The study was carried out from November 2017 to December 2017.
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31 Main outcome measures: The prevalence of nocturnal enuresis in Santo Domingo was found to
32 be 27.9%.
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36 Results: 700 questionnaires were sent to be filled and 682 were returned. 655 fully filled
37 questionnaires met the requirements of the study. 183 children (27.9%) were identified with
38 nocturnal enuresis among which 88 were boys and 95 were girls. Only 11% of children with
39 enuresis sought medical help. No statistical significance was found between gender, order in the
40 family, constipation, and breastfeeding ($p>0.05$). Age, deep sleep and family history of enuresis
41 were strongly associated with nocturnal enuresis.
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50 Conclusions: The prevalence of nocturnal enuresis in Santo Domingo was found to be 27.9% and
51 it was higher compared to some Asian countries but lower than Morocco and Jamaica. Only 11%
52 of children with enuresis sought medical help. Nocturnal enuresis is an important problem in the
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3 pediatric population of Santo Domingo, but very few children receive treatment due to the
4
5 financial costs of healthcare in the Dominican Republic.
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9 **What is already known on this topic?**

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11 Nocturnal enuresis is a common condition seen in many young children of different races
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13 and cultures.
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17 Recent studies have shown that enuresis is a multifactorial condition based on organic
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19 causes as well as genetic risk factors.
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22 The prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is
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24 yet unknown.
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30 **What this study hopes to add?**

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33 The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported
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35 studies from Congo (26%) and Nigeria (21.3%).
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39 Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males
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41 (26.5%).
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45 Only 11% children sought medical help - mainly due to financial concerns.
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INTRODUCTION

Nocturnal enuresis is a common condition seen in many young children.(1) It is defined as bedwetting in a child with no prior history of congenital urogenital defect or acquired defect after the age of 5.(2) This condition can be distressing for both the child and the parents concerned. It has been acknowledged as a benign condition with multifactorial causes present in different cultures and races. Some studies have suggested that the physiology of sleep, hormonal levels such as antidiuretic hormones, electrolytes levels of sodium and potassium and the physiology of the bladder are all potential factors responsible for the pathophysiology of this condition.(3, 4) There have been multiple studies that were carried out for different countries and cultures but the prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet unknown.

The main goal of this study was to determine the prevalence of nocturnal enuresis in Dominican Republic and to identify any associated risk factors. Since health care in Dominican Republic is not free, the questionnaire also investigated if the cost of treatment was an important factor for refusing medical help in children with enuresis. The outcome of this study will allow both parents and the health institutions to understand the prevalence of nocturnal enuresis in Santo Domingo and provide better solutions for the treatment and cost of treatment of children. Proper counseling, education and information can also be done following this study.

MATERIALS AND METHODS

Study design and participants

A cross sectional study was conducted among children attending three primary schools in Santo Domingo, Dominican Republic from November 2017 to December 2017. The study population

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2
3 was randomly selected to include children aging from 5 to 11, from different social strata among
4
5 different schools in Santo Domingo, Dominican Republic.
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8 A questionnaire was designed to help detect children with nocturnal enuresis and different risk
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10 factors. It was first prepared in English and then translated into Spanish (predominant language
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12 in Santo Domingo). The questionnaire was assessed for content validity and modified
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14 accordingly by several experts. Appropriate drafting and editing was done and the final version
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16 was pilot tested with a small batch of 100 students. The questionnaires were sent to be filled by
17
18 the parents and data collection in all schools was performed with the help of the Dean and
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20 teachers. Parents were also advised to keep a sleep journal for the children to improve accuracy
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22 of the data. A contact number was included to answer any questions the parents had while
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24 undertaking the questionnaire.
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29 A total of 682 questionnaires were returned and 655 fully filled questionnaires were considered
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31 for the study. Children were then further divided into different age groups namely: 5 to 7, 7 to 9
32
33 and 9 to 11 years of age. The questionnaire consisted of a set of 22 questions involving age, sex,
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35 order in the family, presence of deep sleep, history of constipation, family history of nocturnal
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37 enuresis, breastfeeding history and management of the condition by parents.
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42 **Statistical analysis**

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45 Data were analyzed using SPSS version 24.0 (SPSS Inc, Chicago, Illinois, USA) for windows
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47 and Chi square test was used to study the associations between categorical variables. Differences
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49 were considered significant when $p < 0.05$.
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Ethical clearance was granted by the schools' boards of ethics and written consent was obtained from the parents as well as assent from the children. Confidentiality of all participants was respected.

RESULTS

Out of 700 questionnaires distributed among the schools, 682 were returned with a response rate of 97.4%. After meticulous selection 655 fully-filled questionnaires were considered for this study. 27 questionnaires were excluded as they were not completely filled. Out of the 655 children, 332(50.7%) were boys and 323(49.3%) were girls.

183 children (27.9%) were identified with primary enuresis among which 88 were boys and 95 were girls. The frequency of enuresis was further subdivided into 3 age groups. 86 children between 5 to 7 years of age, 65 children between 7 to 9 years of age, and 32 children between 9 to 11 years of age, were diagnosed with nocturnal enuresis. 83 parents (51%) admitted that the cost of medical treatment was the main reason for avoiding any medical help. Statistical significance between age, paternal history, maternal history, deep sleep and nocturnal enuresis was found in this study as seen in table 1. Gender, order in the family, constipation and breastfeeding were not statistically relevant to nocturnal enuresis.

Table 1. Prevalence and factors associated with nocturnal enuresis in children from Santo Domingo, Dominican Republic.

	Enuretic	Non Enuretic	p- value
Sex			
Male	88	244	0.407
Female	95	228	
Age			
5-7	86	139	<0.001
7-9	65	157	
	32	176	

9-11			
First Child			
Yes	83	253	0.058
No	100	219	
Deep Sleep			
Yes	121	146	<0.001
No	62	326	
Constipation			
Present	38	123	0.158
Absent	145	349	
Family History			
Paternal			
Present	140	109	<0.001
Absent	43	363	
Maternal			
Present	133	123	<0.001
Absent	50	349	
Breastfeeding up to age of 4 months			
Present	133	326	0.365
Absent	50	146	

163 children (89.0%) who had enuresis did not seek medical help for their condition. The parents opted for self-help strategies among which 134 (82.2%) restricted fluid intake in the child at least 1 hour before bedtime and 122(74.9%) parents woke up the child to empty their bladder. 20 children(11%) sought help from a doctor and 3 children needed further evaluation.

DISCUSSION

This is the first study done in Santo Domingo, Dominican Republic to determine the prevalence of nocturnal enuresis among children aged 5 to 11. The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported studies from Congo (26%)(5) and Nigeria (21.3%)(6) but slightly higher in comparison with India (12.6 %)(7) , Finland (8.2%)(8) and Bangkok (3.9%) (9) . The prevalence in this study was lower than Morocco (35.0%)(10) and Jamaica

(50%) (11). The differences can be attributed to different sample sizes and selection criteria in terms of age and definition of nocturnal enuresis.

Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males(26.5%) with similar results being reported in Congo(5) ,Turkey(12) and Thailand(9) . The prevalence of enuresis in this study decreased with increasing age and a statistical significance confirmed the findings of multiple studies.(5, 13-15) Breastfeeding is considered important for the first 4 months of life but no statistical significance was found in this study which is in accordance with Gumus et al(12) . Singh et al(16) found a higher prevalence of enuresis in children who were not breastfed during the first 4 months of life. There was however no control group in their study and further studies should be carried out to understand the relationship between breastfeeding and enuresis.

Presence of an enuresis history on the maternal or paternal side has often been associated with a higher risk of enuresis in the child (17-19) and a similar conclusion was reached in this study. Previous study has shown that regions on chromosomes 8, 12 and 13 were associated with a higher risk of nocturnal enuresis in the child.(20) Deep sleep has been linked with nocturnal enuresis in this study and similar findings were reported.(5) However proper sleep studies should be performed as suggested by Yeung et al.(21)

Health care in Dominican Republic is not completely free and easily accessible to everyone. 83 parents (51%) admitted that the cost of medical treatment was the main reason for avoiding any medical help. The Dominican Republic is classified by the World Health Organization as a middle-income country. They, however, noted that there is a major gap between economic classes and the lower class families are most affected. In our study, parents have also expressed concerns about the cost of traveling for treatments. An improvement to the current situation can

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3 involve biannual visits by physicians to assess the conditions in schools and provide appropriate
4 care and follow-ups for enuresis for free or at a discounted fee.
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8 The management of nocturnal enuresis in hospitals and health clinics in Dominican Republic
9 involves several steps. A pretreatment evaluation is done by the physician to rule out any history
10 that could raise concern. The initial treatment includes reassurance and starting a diary to
11 monitor fluid intake at night, frequency of bedwetting and any encopresis. In some cases, the
12 parents have to be properly educated that the children are not to be blamed and they should not
13 be punished for bedwetting. Bedwetting alarms are also used in cases of frequent bedwetting and
14 the progress is evaluated by the physician. This usually requires regular follow-ups and in some
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34 medical attention included fluid restriction at least one hour before sleep (82.2%) and waking the
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Confidential: For Review Only

1. Sex: Male Female
2. Age: _____
3. Grade: _____
4. Over the past three months has your child wet the bed? Yes No
5. If yes, how often does he wet the bed per week? <2 times , 2-4 times , 5-7 times
6. How many Children are there in your family: _____
7. Is the participant a first child: Yes , No
8. Does he often wake up by himself during his sleep: Yes , No
9. Is it hard to wake him up at night: Yes , No
10. Does he often complain of constipation: Yes , No
11. If yes: over the last month how many times has he complained of constipation: 1-3 , 4-7 , 7-10 , more than 10 times
12. Anyone on the paternal side of the family with similar bedwetting history: Yes , No
13. If yes was it: Father , another member , father and other members
14. Anyone on the maternal side of the family with similar bedwetting history: Yes , No
15. If yes was it: mother , another member , mother and other members
16. Was he breastfed up to at least 4 months of age: Yes , No
17. If you ticked yes to bedwetting: did you seek any medical treatment: Yes , No
18. If you sought medical treatment, what was the treatment prescribed: _____
19. If you sought medical treatment, was it helpful?
 - Yes he stopped
 - It decreased but still bedwetting
 - No change
20. If you did not seek any medical treatment: what was the main reason:
 - I believe it is a harmless condition and will go away on its own
 - It will be costly
 - It will take away our time
 - Other(please specify): _____
21. If you did not seek medical help, what did you do to stop the bedwetting? No fluid intake in the child at least 1 hour before bedtime , woke up the child to urinate , Other(please specify): _____

22. If the child has any medical condition please specify : _____

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BMJ Paediatrics Open**Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire study of prevalence and risk factors**

Journal:	<i>BMJ Paediatrics Open</i>
Manuscript ID	bmjpo-2018-000311.R3
Article Type:	Original article
Date Submitted by the Author:	18-Jul-2018
Complete List of Authors:	Mejias, Stephanie; Hospital Infantil Robert Reid Cabral, Department of Pediatrics Ramphul, Kamleshun; Shanghai Jiaotong University School of Medicine Xinhua Hospital,
Keywords:	Enuresis

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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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35

36
37 Dr Ramphul was involved in the setup of the study, the statistical analysis of the data, the writing
38 of the article.
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42 *Both authors contributed equally to the study.
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44

45 **Short running title:** Nocturnal enuresis in Santo Domingo
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48 Word count: 2034 (main article) , Table:1 Figures: 0
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3 **Nocturnal enuresis in children from Santo Domingo, Dominican Republic; a questionnaire**
4 **study of prevalence and risk factors**
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8 **Abstract:**
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11 Objective: To determine the prevalence of pediatric nocturnal enuresis in Santo Domingo,
12 Dominican Republic.
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16 Design: A cross-sectional study was performed using a pretested questionnaire.
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20 Setting: Three different schools in Santo Domingo, Dominican Republic
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23 Participants: 700 children aged 5-11 years attending one of the different schools in Santo
24 Domingo, Dominican Republic.
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28 Intervention: The study was carried out from November 2017 to December 2017.
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31 Main outcome measures: Prevalence of nocturnal enuresis
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34 Results: 700 questionnaires were sent to be filled and 682 were returned. 655 fully filled
35 questionnaires met the requirements of the study. 183 children were identified with nocturnal
36 enuresis among which 88 were boys and 95 were girls. Only 11% of children with enuresis
37 sought medical help. The prevalence of nocturnal enuresis was 27.9%. No statistical significance
38 was found between gender, order in the family, constipation, and breastfeeding ($p>0.05$). Age,
39 deep sleep and family history of enuresis were strongly associated with nocturnal enuresis.
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49 Conclusions: The prevalence of nocturnal enuresis in Santo Domingo was found to be 27.9% and
50 it was higher compared to some Asian countries but lower than Morocco and Jamaica. Only 11%
51 of children with enuresis sought medical help. Nocturnal enuresis is an important problem in the
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3 pediatric population of Santo Domingo, but very few children receive treatment due to the
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5 financial costs of healthcare in the Dominican Republic.
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8 9 **What is already known on this topic?**

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11 Nocturnal enuresis is a common condition seen in many young children of different races
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13 and cultures.
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17 Recent studies have shown that enuresis is a multifactorial condition based on organic
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19 causes as well as genetic risk factors.
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22 The prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is
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24 yet unknown.
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27 28 29 30 **What this study hopes to add?**

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33 The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported
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35 studies from Congo (26%) and Nigeria (21.3%).
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39 Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males
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41 (26.5%).
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45 Only 11% children sought medical help - mainly due to financial concerns.
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INTRODUCTION

Nocturnal enuresis is a common condition seen in many young children.(1) It is defined as bedwetting in a child with no prior history of congenital urogenital defect or acquired defect after the age of 5.(2) This condition can be distressing for both the child and the parents concerned. It has been acknowledged as a benign condition with multifactorial causes present in different cultures and races. Some studies have suggested that the physiology of sleep, hormonal levels such as antidiuretic hormones, electrolytes levels of sodium and potassium and the physiology of the bladder are all potential factors responsible for the pathophysiology of this condition.(3, 4) There have been multiple studies that were carried out for different countries and cultures but the prevalence of nocturnal enuresis in the pediatric population of Dominican Republic is yet unknown.

The main goal of this study was to determine the prevalence of nocturnal enuresis in Dominican Republic and to identify any associated risk factors. Since health care in Dominican Republic is not free, the questionnaire also investigated if the cost of treatment was an important factor for refusing medical help in children with enuresis. The outcome of this study will allow both parents and the health institutions to understand the prevalence of nocturnal enuresis in Santo Domingo and provide better solutions for the treatment and cost of treatment of children. Proper counseling, education and information can also be done following this study.

MATERIALS AND METHODS

Study design and participants

A cross sectional study was conducted among children attending three primary schools in Santo Domingo, Dominican Republic from November 2017 to December 2017. The study population

1
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3 was randomly selected to include children aging from 5 to 11, from different social strata among
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5 different schools in Santo Domingo, Dominican Republic.
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8 A questionnaire was designed to help detect children with nocturnal enuresis and different risk
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10 factors. It was first prepared in English and then translated into Spanish (predominant language
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12 in Santo Domingo). The questionnaire was assessed for content validity and modified
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14 accordingly by several experts. Appropriate drafting and editing was done and the final version
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16 was pilot tested with a small batch of 100 students. The questionnaires were sent to be filled by
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18 the parents and data collection in all schools was performed with the help of the Dean and
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20 teachers. Parents were also advised to keep a sleep journal for the children to improve accuracy
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22 of the data. A contact number was included to answer any questions the parents had while
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24 undertaking the questionnaire.
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29 A total of 682 questionnaires were returned and 655 fully filled questionnaires were considered
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31 for the study. Children were then further divided into different age groups namely: 5 to 7, 7 to 9
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33 and 9 to 11 years of age. The questionnaire consisted of a set of 22 questions involving age, sex,
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35 order in the family, presence of deep sleep, history of constipation, family history of nocturnal
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37 enuresis, breastfeeding history and management of the condition by parents.
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42 **Statistical analysis**

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45 Data were analyzed using SPSS version 24.0 (SPSS Inc, Chicago, Illinois, USA) for windows
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47 and Chi square test was used to study the associations between categorical variables. Differences
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49 were considered significant when $p < 0.05$.
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Ethical clearance was granted by the schools' boards of ethics and written consent was obtained from the parents as well as assent from the children. Confidentiality of all participants was respected.

RESULTS

Out of 700 questionnaires distributed among the schools, 682 were returned with a response rate of 97.4%. After meticulous selection 655 fully-filled questionnaires were considered for this study. 27 questionnaires were excluded as they were not completely filled. Out of the 655 children, 332(50.7%) were boys and 323(49.3%) were girls.

183 children (27.9%) were identified with primary enuresis among which 88 were boys and 95 were girls. The frequency of enuresis was further subdivided into 3 age groups. 86 children between 5 to 7 years of age, 65 children between 7 to 9 years of age, and 32 children between 9 to 11 years of age, were diagnosed with nocturnal enuresis. 83 parents (51%) admitted that the cost of medical treatment was the main reason for avoiding any medical help. Statistical significance between age, paternal history, maternal history, deep sleep and nocturnal enuresis was found in this study as seen in table 1. Gender, order in the family, constipation and breastfeeding were not statistically relevant to nocturnal enuresis.

Table 1. Prevalence and factors associated with nocturnal enuresis in children from Santo Domingo, Dominican Republic.

	Enuretic	Non Enuretic	p- value
Sex			
Male	88 (26.5%)	244 (73.5%)	0.407
Female	95 (29.6%)	228 (70.6%)	
Age			
5-7	86 (38.2%)	139 (61.8%)	<0.001
7-9	65 (29.3%)	157 (70.7%)	

9-11	32 (15.4%)	176 (84.6%)	
First Child			
Yes	83 (24.7%)	253 (75.3%)	0.058
No	100 (31.3%)	219 (68.7%)	
Deep Sleep			
Yes	121 (45.3%)	146 (54.7%)	<0.001
No	62 (16.0%)	326 (84.0%)	
Constipation			
Present	38 (23.6%)	123 (76.4%)	0.158
Absent	145 (29.4%)	349 (70.6%)	
Family History			
Paternal			
Present	140 (56.2%)	109 (43.8%)	<0.001
Absent	43 (10.6%)	363 (89.4%)	
Maternal			
Present	133 (52.0%)	123 (48.0%)	<0.001
Absent	50 (12.5%)	349 (87.5%)	
Breastfeeding up to age of 4 months			
Present	133 (29.0%)	326 (71.0%)	0.365
Absent	50 (25.5%)	146 (74.5%)	

163 children (89.0%) who had enuresis did not seek medical help for their condition. The parents opted for self-help strategies among which 134 (82.2%) restricted fluid intake in the child at least 1 hour before bedtime and 122(74.9%) parents woke up the child to empty their bladder. 20 children(11%) sought help from a doctor and 3 children needed further evaluation.

DISCUSSION

This is the first study done in Santo Domingo, Dominican Republic to determine the prevalence of nocturnal enuresis among children aged 5 to 11. The prevalence of nocturnal enuresis was 27.9% and it is in accordance with reported studies from Congo (26%)(5) and Nigeria (21.3%)(6) but slightly higher in comparison with India (12.6 %)(7) , Finland (8.2%)(8) and Bangkok (3.9%) (9) . The prevalence in this study was lower than Morocco (35.0%)(10) and Jamaica

(50%) (11). The differences can be attributed to different sample sizes and selection criteria in terms of age and definition of nocturnal enuresis.

Females had a higher prevalence of nocturnal enuresis in this study (29.4%) than males(26.5%) with similar results being reported in Congo(5) ,Turkey(12) and Thailand(9) . The prevalence of enuresis in this study decreased with increasing age and a statistical significance confirmed the findings of multiple studies.(5, 13-15) Breastfeeding is considered important for the first 4 months of life but no statistical significance was found in this study which is in accordance with Gumus et al(12) . Singh et al(16) found a higher prevalence of enuresis in children who were not breastfed during the first 4 months of life. There was however no control group in their study and further studies should be carried out to understand the relationship between breastfeeding and enuresis.

Presence of an enuresis history on the maternal or paternal side has often been associated with a higher risk of enuresis in the child (17-19) and a similar conclusion was reached in this study. Previous study has shown that regions on chromosomes 8, 12 and 13 were associated with a higher risk of nocturnal enuresis in the child.(20) Deep sleep has been linked with nocturnal enuresis in this study and similar findings were reported.(5) However proper sleep studies should be performed as suggested by Yeung et al.(21)

Health care in Dominican Republic is not completely free and easily accessible to everyone. 83 parents (51%) admitted that the cost of medical treatment was the main reason for avoiding any medical help. The Dominican Republic is classified by the World Health Organization as a middle-income country. They, however, noted that there is a major gap between economic classes and the lower class families are most affected. In our study, parents have also expressed concerns about the cost of traveling for treatments. An improvement to the current situation can

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2
3 involve biannual visits by physicians to assess the conditions in schools and provide appropriate
4 care and follow-ups for enuresis for free or at a discounted fee.
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8 The management of nocturnal enuresis in hospitals and health clinics in Dominican Republic
9 involves several steps. A pretreatment evaluation is done by the physician to rule out any history
10 that could raise concern. The initial treatment includes reassurance and starting a diary to
11 monitor fluid intake at night, frequency of bedwetting and any encopresis. In some cases, the
12 parents have to be properly educated that the children are not to be blamed and they should not
13 be punished for bedwetting. Bedwetting alarms are also used in cases of frequent bedwetting and
14 the progress is evaluated by the physician. This usually requires regular follow-ups and in some
15 cases, a psychological evaluation to rule out any event that might be contributing to the condition
16 is also done. In severe and persistent cases, the physician might consider the use of drugs such as
17 desmopressin. However, their use is not common in Santo Domingo for mild to moderate cases.
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20 The study found out that 20 (11%) children sought medical help and only 3 children have not
21 responded to bedwetting alarms. Prevention measures adopted by parents who did not seek
22 medical attention included fluid restriction at least one hour before sleep (82.2%) and waking the
23 child up to empty their bladder (74.8%). Families in Australia mostly opted for fluid restriction
24 whereas in the US and New Zealand the majority woke their children up to void their bladder.(22,
25 23)
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28 Despite some limitations, the current study is the first to investigate the prevalence of nocturnal
29 enuresis in children from Santo Domingo, Dominican Republic. An improvement to the current
30 study and questionnaire would include the annual income of each household. It can provide an
31 insight on the financial cut-off for seeking medical help. This concept was included in our initial
32 set of 100 questionnaires. Only 13% of the parents reported their annual income and it was
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removed from the final draft used as parents in Dominican Republic were not willing to share that information. It is, however, strongly encouraged to be included in other studies, if the parents are willing to share. A broader study in the population of Dominican Republic through different cities will be helpful to identify children who are at risk for severe enuresis and proper education and prevention can be provided to parents to better help the children concerned.

Acknowledgements

The authors would like to thank all the parents and children who participated in the study and the deans and teachers who helped in collecting the data.

Contributors: MSG, the corresponding author, contributed in collecting the data, organizing the study and takes final responsibility for the decision to submit for publication. RK was involved in the setup of the study, the statistical analysis of the data and writing of the article.

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Competing interests: None declared.

Patient consent: Parental/guardian consent obtained for each questionnaire.

Ethics approval: The ethics committee of each school read and approved the research.

Provenance and peer review: Not commissioned; externally peer reviewed.

Data sharing statement: All the data in the study are available to researchers via a data request to the corresponding author.

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1. Sex: Male Female
2. Age: _____
3. Grade: _____
4. Over the past three months has your child wet the bed? Yes No
5. If yes, how often does he wet the bed per week? <2 times , 2-4 times , 5-7 times
6. How many Children are there in your family: _____
7. Is the participant a first child: Yes , No
8. Does he often wake up by himself during his sleep: Yes , No
9. Is it hard to wake him up at night: Yes , No
10. Does he often complain of constipation: Yes , No
11. If yes: over the last month how many times has he complained of constipation: 1-3 , 4-7 , 7-10 , more than 10 times
12. Anyone on the paternal side of the family with similar bedwetting history: Yes , No
13. If yes was it: Father , another member , father and other members
14. Anyone on the maternal side of the family with similar bedwetting history: Yes , No
15. If yes was it: mother , another member , mother and other members
16. Was he breastfed up to at least 4 months of age: Yes , No
17. If you ticked yes to bedwetting: did you seek any medical treatment: Yes , No
18. If you sought medical treatment, what was the treatment prescribed: _____
19. If you sought medical treatment, was it helpful?
 - Yes he stopped
 - It decreased but still bedwetting
 - No change
20. If you did not seek any medical treatment: what was the main reason:
 - I believe it is a harmless condition and will go away on its own
 - It will be costly
 - It will take away our time
 - Other(please specify): _____
21. If you did not seek medical help, what did you do to stop the bedwetting? No fluid intake in the child at least 1 hour before bedtime , woke up the child to urinate , Other(please specify): _____

22. If the child has any medical condition please specify : _____

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