



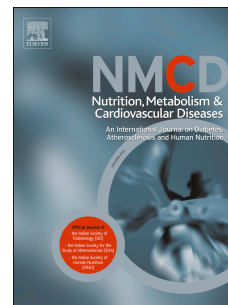
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

# Journal Pre-proof

COVID-19 forced restrictions did not AFFECT metabolic control in youth with T2D in Italy

Stefano Zucchini, Dario Iafusco, Valentino Cherubini, Luisa De Sanctis, Giulio Maltoni, Lorenzo Lenzi, Enza Mozzillo, Valeria Calcaterra, Francesco Gallo, Claudia Arnaldi, Maurizio Delvecchio, Ivana Rabbone, Nicola Minuto, Barbara Predieri, Angela Zanfardino, Alessia Piscopo, Valentina Tiberi, Davide Tinti, Novella Rapini, Sonia Toni, Riccardo Schiaffini, on behalf of the Diabetes Study Group of the ISPED



PII: S0939-4753(22)00424-0

DOI: <https://doi.org/10.1016/j.numecd.2022.10.012>

Reference: NUMECD 3148

To appear in: *Nutrition, Metabolism and Cardiovascular Diseases*

Received Date: 30 August 2022

Accepted Date: 18 October 2022

Please cite this article as: Zucchini S, Iafusco D, Cherubini V, De Sanctis L, Maltoni G, Lenzi L, Mozzillo E, Calcaterra V, Gallo F, Arnaldi C, Delvecchio M, Rabbone I, Minuto N, Predieri B, Zanfardino A, Piscopo A, Tiberi V, Tinti D, Rapini N, Toni S, Schiaffini R, on behalf of the Diabetes Study Group of the ISPED, COVID-19 forced restrictions did not AFFECT metabolic control in youth with T2D in Italy, *Nutrition, Metabolism and Cardiovascular Diseases*, <https://doi.org/10.1016/j.numecd.2022.10.012>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Published by Elsevier B.V. on behalf of The Italian Diabetes Society, the Italian Society for the Study of Atherosclerosis, the Italian Society of Human Nutrition and the Department of Clinical Medicine and Surgery, Federico II University.

**LETTER****COVID-19 FORCED RESTRICTIONS DID NOT AFFECT METABOLIC CONTROL IN YOUTH WITH T2D IN ITALY**

Stefano Zucchini<sup>1</sup>, Dario Iafusco<sup>2</sup>, Valentino Cherubini<sup>3</sup>, Luisa De Sanctis<sup>4</sup>, Giulio Maltoni<sup>1</sup>, Lorenzo Lenzi<sup>5</sup>, Enza Mozzillo<sup>6</sup>, Valeria Calcaterra<sup>7</sup>, Francesco Gallo<sup>8</sup>, Claudia Arnaldi<sup>9</sup>, Maurizio Delvecchio<sup>10</sup>, Ivana Rabbone<sup>11</sup>, Nicola Minuto<sup>12</sup>, Barbara Predieri<sup>13</sup>, Angela Zanfardino<sup>2</sup>, Alessia Piscopo<sup>2</sup>, Valentina Tiberi<sup>3</sup>, Davide Tinti<sup>4</sup>, Novella Rapini<sup>14</sup>, Sonia Toni<sup>5</sup>, Riccardo Schiaffini<sup>14</sup> on behalf of the Diabetes Study Group of the ISPED

<sup>1</sup>IRCCS AOU di Bologna Policlinico di S.Orsola, Woman and Child, Bologna, Italy, <sup>2</sup>University of Campania "Luigi Vanvitelli", Naples, Italy, <sup>3</sup>G. Salesi Children's Hospital, Azienda Ospedaliero - Universitaria Ospedali Riuniti, Ancona, Italy, <sup>4</sup>Centre of Pediatric Diabetology, AOU Città Della Salute e Della Scienza, Department of Pediatrics, University of Turin, Torino, Italy,

<sup>5</sup>Anna Meyer Children's Hospital, Florence, Italy, <sup>6</sup>University Federico II, Naples, Italy, <sup>7</sup>Pediatric Department, "Vittore Buzzi" Children's Hospital, Milan and University of Pavia, Italy, <sup>8</sup>Ospedale Antonio Perrino, Brindisi, Italy, <sup>9</sup>UOS Diabetologia pediatrica ASL Viterbo, Viterbo, Italy, <sup>10</sup>Ospedale Pediatrico Giovanni XXIII, Bari, Italy, <sup>11</sup> Department of Health Sciences, University of Piemonte Orientale, Novara, Italy, <sup>12</sup>IRCCS Istituto Giannina Gaslini, Genoa, Italy, <sup>13</sup>Università di Modena e Reggio Emilia, Modena, <sup>14</sup>Diabetes Unit, Bambino Gesù Children's Hospital, Rome, Italy

Correspondence to: Valentino Cherubini [valentino.cherubini@staff.univpm.it](mailto:valentino.cherubini@staff.univpm.it)

Keywords. Type-2 diabetes, adolescence, Sars-Cov-2 infection, lockdown, HbA1c, BMI

The Authors have no competing interests to declare.

Word count 493 (word limit 500)

The impact of the COVID-19 pandemic was early and severe in Italy. Movement restrictions and social distancing imposed by government measures due to the COVID-19 pandemic have resulted in increased body mass index (BMI) in obese patients worldwide [1,2]. Recent reports have suggested an increasing incidence in childhood type 2 diabetes (T2D) during the COVID-19 pandemic [3]. Few data on glycemic control was reported in children and adolescents with T2D during the forced lockdown [4,5]. On the other hand, improved metabolic control has been reported in Italian children with T1D after the COVID-19 lockdown [6,7]. We aimed to investigate whether there had been any changes in clinical and metabolic data in youth with T2D following COVID-19 government restriction measures in Italy. A retrospective multicenter study involved 14 Italian pediatric centres. All children with T2D followed by the centres were recruited for this study, 60% were of Italian origin, 34% African and 16% from Eastern Europe. Diagnosis of T2D was confirmed with the absence of beta-cell auto-antibodies and the exclusion of monogenic diabetes. Clinical and laboratory data collected in the 6 months prior to the restrictions and 6 months after the suspension of the restrictions were available for all youth under 20 years of age. Body weight, height, blood pressure, waist circumference, HbA1c, total and HDL cholesterol, and triglycerides were assessed in both visits. Hemoglobin A1c was measured with DCA Vantage Analyzer (Siemens). Changes between before and after restriction were analyzed using the Wilcoxon Signed-Rank test. Data on 61 adolescents (24 males) were analyzed. At the visit before the restrictions, the mean age and duration of diabetes were 14.6 (2.4) years and 2.5 (1.5) years, respectively. The mean time between the two visits was 10.2 (5.3) months. Therapeutic strategies were distributed as follows: 31 with metformin, 8 with insulin, 4 with diet alone, 18 with metformin plus insulin. No changes were reported between the two visits for clinical and biological variables (Table 1). Furthermore, no gender differences were found for all variables studied nor differences between ethnic groups. The main limitations of this study were the retrospective design and the different evaluation time between the visit before and after the forced lockdown. The prevalence of young people with T2D in Italy is still limited and the small number did not allow to make comparative

assessments on the different ethnic group of the participants. However, the recruitment of young people with T2D was 100% of the patients followed by the centres that participated in the study. Stay-at-home order and reduced access to physical activity worsened glycemic control in youth with T2D of other countries [4,5]. The lack of changes in clinical and metabolic data that we observed in youth with DT2 could be explained by the increased attention of parents to their children during family constriction in the home. Continuous and accurate data collection is needed for different T2D pediatric populations to better understand the trends and outcomes for this population during sudden lifestyle changes.

The Authors have nothing to disclose

The present letter has not been published previously (except in the form of an abstract), is not under consideration for publication elsewhere. Its publication is approved by all authors and tacitly or explicitly by the responsible authorities. If accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

**REFERENCES**

1. Sideli L, Lo Coco G, Bonfanti RC, Borsarini B, Fortunato L, Sechi C, et al. Effects of COVID-19 lockdown on eating disorders and obesity: A systematic review and meta-analysis. *Eur Eat Disord Rev.* 2021;29(6):826–41.
2. Maltoni G, Zioutas M, Deiana G, Biserni GB, Pession A, Zucchini S. Gender differences in weight gain during lockdown due to COVID-19 pandemic in adolescents with obesity. *Nutr Metab Cardiovasc Dis.* 2021 Jun 30;31(7):2181-2185.
3. Schmitt JA, Ashraf AP, Becker DJ SB. Changes in Type 2 Diabetes Trends in Children and Adolescents During the COVID-19 Pandemic. *J Clin Endocrinol Metab.* 2022;107(7):e2777–82.
4. Cheng HP, Wong JSL, Selveindran NM, Hong JYH. Impact of COVID-19 lockdown on glycaemic control and lifestyle changes in children and adolescents with type 1 and type 2 diabetes mellitus. *Endocrine [Internet].* 2021;73(3):499–506. Available from: <http://dx.doi.org/10.1007/s12020-021-02810-1>
5. Muñoz CE, Chao LC. Impact of COVID-19 on Youth With Type 2 Diabetes: Lessons Learned From a Pediatric Endocrinologist and a Psychologist. *Front Endocrinol (Lausanne).* 2021;12(May):19–22.
6. Marigliano M, Maffei C. Glycemic control of children and adolescents with type 1 diabetes improved after COVID-19 lockdown in Italy. *Acta Diabetol [Internet].* 2021;58(5):661–4. Available from: <https://doi.org/10.1007/s00592-020-01667-6>
7. Predieri B, Leo F, Candia F, Lucaccioni L, Madeo SF, Pugliese M, et al. Glycemic Control Improvement in Italian Children and Adolescents With Type 1 Diabetes Followed Through Telemedicine During Lockdown Due to the COVID-19 Pandemic. *Front Endocrinol (Lausanne).* 2020;11(December):1–10.

**Table 1. Clinical and biochemical outcomes of youth with type 2 diabetes before and after government restriction measures to limit COVID-19 epidemic in Italy**

	All			Non-insulin treated			Insulin treated		
	Before Restrictions	After Restrictions	<i>p</i>	Before Restrictions	After Restrictions	<i>p</i>	Before Restrictions	After Restrictions	<i>p</i>
N	61	61		37	37		24	24	
HbA1c, %	7.0 (1.8)	7.3 (2.1)	NS	5.9 (0.8)	6.4 (1.9)	NS	8.35 (1.9)	8.2 (1.7)	NS
BMI SDS	2.4 (0.8)	2.1 (0.9)	NS	2.1 (1.1)	1.9 (1.1)	NS	2.4 (0.8)	2.1 (0.9)	NS
Waist/Height ratio	0.58 (0.09)	0.56 (0.16)	NS	0.6 (0.09)	0.58 (0.1)	NS	0.55 (0.08)	0.52 (0.1)	NS
Total Cholesterol, mg/dl	170 (35)	176 (35)	NS	161.3 (33.7)	172 (27.1)	NS	183 (33.6)	181.9 (34.9)	NS
HDL Cholesterol, mg/dl	45.3 (9)	44.3 (12)	NS	46.9 (11.1)	45.2 (11.9)	NS	42.7 (10.8)	42.9 (12)	NS
Triglycerides, mg/dl	128 (198)	141 (73)	NS	86.8 (35.4)	114.5 (52.5)	NS	133.8 (70.5)	175.7 (93.1)	NS
Systolic BP, mmHg	120 (58)	123 (54)	NS	120 (62)	121 (60)	NS	119 (58)	122 (61)	NS
Diastolic BP, mmHg	76 (57)	72 (54)	NS	75 (54)	73 (48)	NS	76 (55)	71 (62)	NS

Letter to the Editor: COVID-19 FORCED RESTRICTIONS DID NOT AFFECT METABOLIC CONTROL  
IN YOUTH WITH T2D IN ITALY

The Authors have nothing to disclose.

Valentino Cherubini on Behalf of all Authors

Journal Pre-proof