

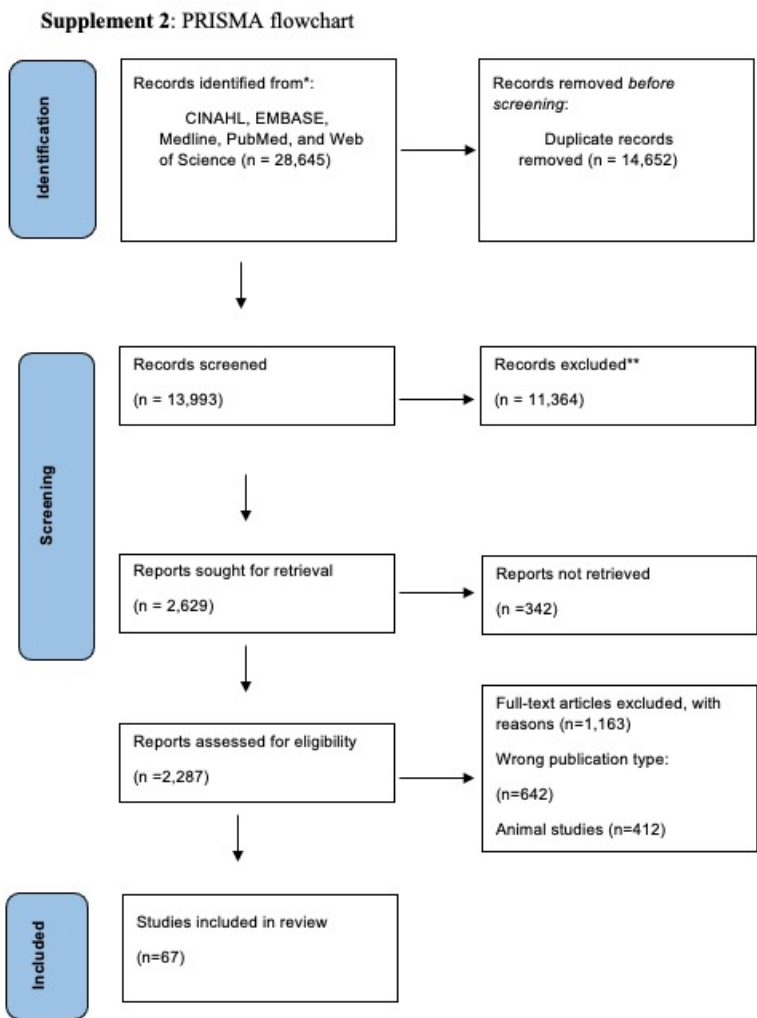
Introduction

- Hypertension is one of the most prevalent diseases in the world and affects 3.5% of children and adolescents within the United States.
- Hypertension has been shown to adversely affect most organ systems, but is specifically detrimental to the cardiovascular system. These effects can be gauged through well-known parameters of cardiovascular function including left ventricular mass index, left ventricular hypertrophy, carotid intima media thickness, uric acid levels and aortic stiffness.
- Cardiovascular function is severely affected in obesity, but is often overlooked in underlying chronic kidney disease, renovascular hypertension/fibromuscular disorder, and hyperlipidemia. Thus, changes in its parameters are predictive of cardiovascular dysfunction.

Objectives

- Assess AKI incidence among COVID-19 pediatric patients in the pediatric ICU within North America using VPS data.
- Assess AKI associated risk factors, treatments such as KRT, and associated mortality rates among COVID-19 pediatric patients within North America using the VPS data.

Methodology



- Design and Data Collection:** An exhaustive literature search was conducted for clinical data regarding pediatric hypertension. A total of 67 articles were included with data on 189,477 subjects reported. The data was then extracted and categorized as relating to its incidence, left ventricular mass index, left ventricular hypertrophy, carotid intima media thickness, and/or aortic stiffness.

Table 1: Pediatric ambulatory arterial stiffness index, pulse wave velocity, and pulse pressure

		N	Years	24-h (mm Hg)			
		Sample	Age	SBP	DBP	MAP	PP
Stergiou et al. <sup>21</sup>	Normotensive	66	12.8	115.10	64.70	-	50.40
	Hypertensive	16	14	135.60	74.30	-	61.30
Simonetti et al. <sup>108</sup>	Normotensive	71	12.1	109.50	66.40	80.70	43.40
	Hypertensive	114	12	125.50	77.90	93.70	47.60
Kollios et al. <sup>109</sup>	Normotensive	45	10.09	108.78	64.42	95.64	-
	Hypertensive	10	11.2	123.70	71.30	102.33	-
Skrzypczyk <sup>75</sup> (2019)	Normotensive	-	-	-	-	-	-
	Hypertensive	177	15.04	128.17	70.84	89.95	57.53
Skrzypczyk <sup>110</sup> (2018)	Normotensive	20	15.55	119.85	65.55	83.70	54.20
	Hypertensive	54	15.12	134.85	74.11	94.33	60.78
Total/Average	Normotensive	202	12.635	99.73	69.81	76.85	46.90
	Hypertensive	371	13.472	129.56	73.69	95.08	56.80

Table 4: Ambulatory arterial stiffness index measurements, pulse velocity, and pulse pressure data points extracted from 5 studies of pediatric/adolescent cohorts. Abbreviations: SBP: Systolic blood pressure. DBP: Diastolic blood pressure. MAP: Mean arterial pressure. PP: Pulse pressure.

Table 1: Ambulatory arterial stiffness parameters assessed over 5 studies (n=573) in the normotensive cohort averaged 99.73 mmHg, 69.81 mmHg, 76.85 mmHg, and 46.90 mmHg, for SBP, DBP, MAP, and PP respectively. Ambulatory arterial stiffness parameters assessed over 5 studies (n=573) in the hypertensive cohort averaged 129.56 mmHg, 73.69 mmHg, 95.08 mmHg, and 56.80 mmHg, for SBP, DBP, MAP, and PP respectively.

Table 2: Left Ventricular Mass index

Last Name	Year	Age	Sample Size	LVMI (g/m2.7)	Control
Mirchandani et al. <sup>90</sup>	2014	8-18	109	42.3	-
Mir et al. <sup>91</sup>	2016		35	32.9	28.8
Meng et al. <sup>92</sup>	2015	9-15	232	34	28±6
Lande et al. <sup>93</sup>	2006	12-17	35	36	-
Sorof et al. <sup>94</sup>	2003	11-16	32	46.8	31.4
Bjelakovic et al. <sup>95</sup>	2015	10-16	94	46.6	38.2±8.8
Stabouli et al. <sup>96</sup>	2009	5-18	124	36.8	29.5±8.3
Total/Average			661	39.3	30.1

Table 2: Left ventricular mass index (LVMI) values extracted from 7 studies of pediatric/adolescent cohorts.

Table 2: The left ventricular mass index assessed over 7 studies (n=661) averaged 39.3 g/m<sup>2.7</sup> in the hypertensive cohort and 30.1 g/m<sup>2.7</sup> in the control cohort.

Table 3: Carotid Intima Media Thickness

Table 3: Carotid intima-media thickness

Last Name	Year	Age	Sample Size	cIMT (mm)	Control
Mir et al. <sup>91</sup>	2016	<18	35	0.46	0.35
Meng et al. <sup>92</sup>	2015	9-15	232	0.49	0.46
Litwin et al. <sup>101</sup>	2004	6-20	110	0.45	0.41
Gil et al. <sup>102</sup>	2008	13-18	32	0.62	0.5
Lande et al. <sup>93</sup>	2006	12-17	35	0.67	0.63
Sorof et al. <sup>94</sup>	2003	11-16	32	0.72	0.63
Antoniewicz et al. <sup>103</sup>	2006	5-20	104	0.47	0.43
Total/Average			580	0.55	0.49

Table 3: Carotid intima-media thickness (cIMT) values extracted from 7 studies of pediatric/adolescent cohorts.

Table 3: The carotid intima-media thickness assessed over 7 studies (n=580) averaged 0.55 mm in the hypertensive cohort and 0.49 mm in the control cohort.

Results

- Data regarding 1240 reported patients was analyzed. The incidence of pediatric (<18 years) hypertension extracted from 47 studies from 1994 to 2018 averaged 4%.
- Among the 1240 patients, there were 42 confirmed deaths and 1198 patients discharged.

Conclusion

Sustained hypertension can lead to a number of adverse cardiovascular outcomes, all of which are accentuated in the pediatric population due to their lifelong complications. Cardiovascular parameters including LVMI, LVH, cIMT, AASI, PWV, PP and uric acid levels can all be readily monitored. The well-established literature outlines the degree of correlation of each parameter and emphasizes its importance to cardiovascular health. Thus, prompt detection and intervention are imperative to prevent and control hypertension, especially in pediatric populations with often overlooked underlying conditions, to minimize the risk of cardiovascular disease.

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