Table S1. Study characteristics of the articles included in the study.

References	Hardy-Weinberg	Method	Sample size (N)		Country or Population	Statin	Gene / variant	Phenotype / outcome	Major Findings
			Case/Cohort	Control					
Türthy. International journal of molecular sciences, 26(22), 11144. https://doi.org/10.3390/ijms262211144	NR	qPCR and sequencing	31	31	Spain	Atorvastatin Rosuvastatin Simvastatin Pitavastatin	*HLA-DRB1*11* and *SLCO1B1 rs4149056*	Non-immune myotoxicity (IMNM) with asymptomatic CK elevation and immune-mediated necrotizing myopathy	The frequency of the HLA-DRB1*11 allele was significantly higher in patients with anti-HMGCR IMNM compared to those with non-immune myotoxicity and controls, confirming a strong association between the HLA-DRB1*11 allele and anti-HMGCR IMNM. *SLCO1B1* rs4149056 variant showed no association with either IMNM or non-immune muscle toxicity
Fukunaga, K., Nakagawa, H., Ishikawa, T., Kubo, M., & Mushiroda, T. (2016). *ABCB1* polymorphism is associated with atorvastatin-induced liver injury in Japanese population. BMC genetics, 17(1), 79. https://doi.org/10.1186/s12863-016-0390-5	yes	PCR	30	414	Japanese population	Atorvastatin	*CYP2C9, CYP2C19, CYP3A4, CYP3A5, UGT1A1, ABCB1, ABCG2* and *SLCO1B1*	Atorvastatin-induced liver injury (AILI)	These results indicate that *ABCB1* rs2032582 was significantly associated with liver injury, indicating that the G allele might be a risk factor. No other polymorphisms showed a significant association with AILI
Lönnberg, K. I., Tornio, A., Hirvensalo, P., Keskitalo, J., Mustaniemi, A. L., Kiiski, J. I., Filppula, A. M., & Niemi, M. (2023). Real-world pharmacogenetics of statin intolerance: effects of *SLCO1B1*, *ABCG2* , and CYP2C9 variants. Pharmacogenetics and genomics, 33(7), 153–160. https://doi.org/10.1097/FPC.0000000000000504	yes	Open Array and qPCR	2042		Finish population	Atorvastatin Fluvastatin Pravastatin Rosuvastatin Simvastatin	*SLCO1B1 rs4149056, ABCG2 c.421C>A, CYP2C9*2* and **3*	Primary statin intolerance phenotype: switching initial statin to another and Secondary intolerance phenotype: primary intolerance phenotype combined with CK measurement	*SLCO1B1* c.521C/C genotype was associates with simvastatin intolerance, no significant association was observed with atorvastatin and rosuvastatin. The sample sizes for fluvastatin and pravastatin were relatively small, but *SLCO1B1* c.521T>C carriers had an increased risk of pravastatin intolerance defined by statin switching when compared to homozygous reference T/T genotype.

Ramakumari, N., Indumathi, B., Katkam, S. K., & Kutala, V. K. (2018). Impact of pharmacogenetics on statin-induced myopathy in South-Indian subjects. Indian heart journal, 70 Suppl 3(Suppl 3), S120–S125. https://doi.org/10.1016/j.ihj.2018.07.009	NR	qPCR and sequencing	202		South-Indian	Atorvastatin Rosuvastatin	*CYP3A5*3 T>C* (rs776746), *COQ2 G>C* (rs4693075), and *SLCO1B1 T>C* (rs4149056)	Myopathy	Although the frequency of *CYP3A5**3 splicing variant was higher in myopathy group, they could not find association of *CYP3A5*, COQ, and *SLCO1B1* gene polymorphisms with either rosuvastatin or atorvastatin
Isackson, P. J., Wang, J., Zia, M., Spurgeon, P., Levesque, A., Bard, J., James, S., Nowak, N., Lee, T. K., & Vladutiu, G. D. (2018). RYR1 and CACNA1S genetic variants identified with statin-associated muscle symptoms. Pharmacogenomics, 19(16), 1235–1249. https://doi.org/10.2217/pgs-2018-0106	NR	sequencing	76	50	Caucasian, Euro-American, African–American and Asian (USA and Canada)	Not reported	*RYR1* and *CACNA1S*	Statin-associated muscle symptoms	RYR1 and CACNA1S genetic variants are likely to be a major contributor to the susceptibility to statin-associated muscle symptoms, due to subjects with probably pathogenic RYR1 or CACNA1S variants had plasma CK 5X to more than 400X the upper limit of normal in addition to having muscle symptoms
Hubáček, J. A., Dlouhá, D., Adámková, V., Zlatohlavek, L., Viklický, O., Hrubá, P., Češka, R., & Vrablík, M. (2015). *SLCO1B1* polymorphism is not associated with risk of statin-induced myalgia/myopathy in a Czech population. Medical science monitor : international medical journal of experimental and clinical research, 21, 1454–1459. https://doi.org/10.12659/MSM.893007	yes	PCR	993	2301	Czech	Simvastatin Atorvastatin	*SLCO1B1* rs4363657	Myalgia/myopathy	No association between *SLCO1B1* gene polymorphism and risk of myalgia/myopathy.
Oh, J., Ban, M. R., Miskie, B. A., Pollex, R. L., & Hegele, R. A. (2007). Genetic determinants of statin intolerance. *Lipids in health and disease*, *6*, 7.	yes	qPCR	133	158	Canada	NR	*COQ2*	Myopathy	These preliminary pharmacogenetic results, if confirmed, are consistent with the idea that statin intolerance is associated with genomic variation in COQ2

https://doi.org/10.1186/1476-511X-6-7									
Türkmen, D., Bowden, J., Masoli, J. A. H., Melzer, D., & Pilling, L. C. (2024). *SLCO1B1* Exome Sequencing and Statin Treatment Response in 64,000 UK Biobank Patients. International journal of molecular sciences, 25(8), 4426. https://doi.org/10.3390/ijms25084426	NR	qPCR and sequencing	64000		Scotland and England	Simvastatin Atorvastatin	*SLCO1B1*	increased LDL levels, higher statin discontinuation, and increased clinically diagnosed muscle symptoms	*SLCO1B1**5 and *15 haplotype, were associated with higher LDL levels during statin treatment and with an increased likelihood of statin discontinuation, while *SLCO1B1**15 and *20 were linked to a higher risk of clinically diagnosed muscle symptoms in statin-treated patients
Lu, B., Sun, L., Seraydarian, M., Hoffmann, T. J., Medina, M. W., Risch, N., Iribarren, C., Krauss, R. M., & Oni-Orisan, A. (2021). Effect of *SLCO1B1* T521C on Statin-Related Myotoxicity With Use of Lovastatin and Atorvastatin. Clinical pharmacology and therapeutics, 110(3), 733–740. https://doi.org/10.1002/cpt.2337	yes	Array	233	2342	California	Lovastatin Atorvastatin Simvastatin	*SLCO1B1* rs4149056	statin-induced myotoxicity	*SLCO1B1* rs4149056 was associated with an increased risk of statin-induced myopathy and rhabdomyolysis in simvastatin and lovastatin users, while evidence for atorvastatin was weaker and not statistically conclusive.
Voora, D., Baye, J., McDermaid, A., Narayana Gowda, S., Wilke, R. A., Nicole Myrmoe, A., Hajek, C., & Larson, E. A. (2022). *SLCO1B1**5 Allele Is Associated With Atorvastatin Discontinuation and Adverse Muscle Symptoms in the Context of Routine Care. Clinical pharmacology and therapeutics, 111(5), 1075–1083. https://doi.org/10.1002/cpt.2527	NR	Array	1627		USA	Atorvastatin	*SLCO1B1* rs4149056	Atorvastatin Discontinuation and SAMS	*SLCO1B1**5 was associated with a higher likelihood of atorvastatin discontinuation and with an increased risk of statin-associated musculoskeletal symptoms

Bakar, N. S., Neely, D., Avery, P., Brown, C., Daly, A. K., & Kamali, F. (2018). Genetic and Clinical Factors Are Associated With Statin-Related Myotoxicity of Moderate Severity: A Case-Control Study. Clinical pharmacology and therapeutics, 104(1), 178–187. https://doi.org/10.1002/cpt.887	NR	PCR	125	481	Self-reported European ancestry	Simvastatin Atorvastatin	*SLCO1B1* rs4149056 *ABCC2* rs717620 *ABCG2* rs2231142 *CYP3A4* rs35599367 *COQ2* rs4693075 *GATM* rs9806699 *SLC16A1* rs9429505 *SLC16A3* rs7503429	statin-related muscle toxicity 2(SRM), myalgia without significant CK elevation (>4 times upper ULN)	Only *SLCO1B1* rs4149056 was associated with SRM and this association was influenced by sex
Merćep, I., Radman, I., Trkulja, V., Božina, T., Šimičević, L., Budimir, E., Ganoci, L., & Božina, N. (2022). Loss of function polymorphisms in *SLCO1B1* (c.521T>C, rs4149056) and *ABCG2* (c.421C>A, rs2231142) genes are associated with adverse events of rosuvastatin: a case-control study. *European journal of clinical pharmacology*, *78*(2), 227–236. https://doi.org/10.1007/s00228-021-03233-7	NR	qPCR	88	129	Croatia	Rosuvastatin	*SLCO1B1* rs4149056 *ABCG2* rs2231142	Myotoxicity and hepatotoxicity	*SLCO1B1* c.521T>C and *ABCG2* c.421C>A genes are associated with the presence of rosuvastatin related myotoxicity and/or hepatotoxicity
Linskey, D. W., English, J. D., Perry, D. A., Ochs-Balcom, H. M., Ma, C., Isackson, P. J., Vladutiu, G. D., & Luzum, J. A. (2020). Association of *SLCO1B1* c.521T>C (rs4149056) with discontinuation of atorvastatin due to statin-associated muscle symptoms. *Pharmacogenetics and genomics*, *30*(9), 208–211.	yes	qPCR	379		Caucasians	Atorvastatin	*SLCO1B1* rs4149056	discontinuation of atorvastatin due to SAMS (characterized by myopathy (weakness), myalgia (muscle pain), and commonly	*SLCO1B1* c.521T>C was not significantly associated with discontinuation of atorvastatin therapy due to SAMS.

https://doi.org/10.1097/FPC.0000000000000412								elevation in serum creatine kinase) and discontinuation of atorvastatin	
Frudakis, T. N., Thomas, M. J., Ginjupalli, S. N., Handelin, B., Gabriel, R., & Gomez, H. J. (2007). CYP2D6*4 polymorphism is associated with statin-induced muscle effects. *Pharmacogenetics and genomics*, *17*(9), 695–707. https://doi.org/10.1097/FPC.0b013e328012d0a9	yes	PCR	75	188	USA	Atorvastatin	388 SNPs	statin-related muscle events	Only CYP2D6*4 was associated with statin-related muscle events in patients treated with atorvastatin; although the association was not statistically significant for simvastatin, the allele was similarly distributed among patients with simvastatin-induced muscle events.
Jansen, M. E., Rigter, T., Fleur, T. M. C., Souverein, P. C., Verschuren, W. M. M., Vijverberg, S. J., Swen, J. J., Rodenburg, W., & Cornel, M. C. (2023). Predictive Value of *SLCO1B1* c.521T>C Polymorphism on Observed Changes in the Treatment of 1136 Statin-Users. *Genes*, *14*(2), 456. https://doi.org/10.3390/genes14020456	yes	Array	1136		Dutch	Atorvastatin Simvastatin	*SLCO1B1* rs4149056	Discontinuation or switch statin treatment	could not confirm an association between the *SLCO1B1* c.521T>C genotype and any change in statin therapy
Lalatović, N., Ždralević, M., Antunović, T., & Pantović, S. (2023). Genetic polymorphisms in *ABCB1* are correlated with the increased risk of atorvastatin-induced muscle side effects: a cross-sectional study. *Scientific reports*, *13*(1), 17895. https://doi.org/10.1038/s41598-023-44792-2	yes	PCR	41	69	Montenegro	Atorvastatin	*ABCB1* 1236C > T, 2677G > T/A, and 3435C > T	SAMS	patients with TT genotype in 1236C > T, 2677G > T/A, and 3435C > T polymorphisms had higher SAMS risk compared to wild type and heterozygous carriers together. Furthermore, TTT/TTT diplotype was also associated with a higher risk of SAMS.

Dheyaa Aziz, N., Abbood, S. H., Al-Mayali, A. H., & Hadi, N. R. (2023). ASSOCIATION OF SOLUTE CARRIER ORGANIC ANION TRANSPORTER 1B1 GENE POLYMORPHISM WITH RESPONSE TO ATORVASTATIN AND ASSOCIATED MYOPATHY IN IRAQI DYSLIPIDEMIA PATIENTS. *Polski merkuriusz lekarski : organ Polskiego Towarzystwa Lekarskiego*, *51*(5), 496–503. https://doi.org/10.36740/Merkur202305108	NR	PCR	70	130	Arabic race	Atorvastatin	*SLCO1B1* rs4149056, rs2306283, rs55901008, and rs72559745	myopathy and poor response to atorvastatin therapy	The mutant allele's genotypes of SLC01B1 rs4149056, rs55901008, and rs72559745, and the wild allele genotype of rs2306283 show significant association with the development of poor response to atorvastatin and elevated the level of CK-MM plasma concentration
Neřoldová, M., Stránecký, V., Hodaňová, K., Hartmannová, H., Piherová, L., Přistoupilová, A., Mrázová, L., Vrablík, M., Adámková, V., Hubáček, J. A., Jirsa, M., & Kmoch, S. (2016). Rare variants in known and novel candidate genes predisposing to statin-associated myopathy. *Pharmacogenomics*, *17*(13), 1405–1414. https://doi.org/10.2217/pgs-2016-0071	yes	sequencing	88		Czech	Simvastatin Atorvastatin Rosuvastatin	Whole exome sequencing	SAMS	Rare variants in CLCN1, MYOT, *CYP3A5*, SH3TC2, FBXO32 and RBM20 and *SLCO1B1*5* were identified in patients with statin-associated myopathy, suggesting that rare genetic alterations in genes related to muscle function or drug metabolism may contribute to susceptibility to statin-induced myopathy.
Alghalyini, B., El Shamieh, S., Salami, A., Visvikis Siest, S., Fakhoury, H. M., & Fakhoury, R. (2018). Effect of *SLCO1B1* gene polymorphisms and vitamin D on statin-induced myopathy. *Drug metabolism and personalized therapy*, *33*(1), 41–47. https://doi.org/10.1515/dmpt-2017-0030	yes	qPCR	22	28	Saudi Arabians	Rosuvastatin Atorvastatin Simva	*SLCO1B1* rs4149056, rs2306283	SAMS	*SLCO1B1* rs2306283A>G, and rs4149056T>C did not show any association with SAMs. Haplotype analysis showed that *SLCO1B1* *1B and *15 were more prevalent in individuals with SAM
Tipnoppanon, S., Udomnilobol, U., Siwamogsatham, S., Vorasettakarnkij, Y., Sukasem, C., Prueksaritanont, T., Chariyavilaskul, P., Yodsurang, V., Srimatimanon, T., Chamnanphon, M., & Vanwong, N.	yes	Array	89		Thai population	Simvastatin	*ABCB1, ABCC2, ABCG2, SLCO1B1, SLCO1B3, CYP3A4,*	Elevated simvastatin exposure	The results suggest that *SLCO1B1* c.521T>C, alone or with c.388A>G (*SLCO1B1**1b/*15), reduces OATP1B1 function, leading to elevated simvastatin acid levels and increased myotoxicity risk

(2025). Impacts of Pharmacokinetic Gene Polymorphisms on Steady-State Plasma Concentrations of Simvastatin in Thai Population. *Clinical and translational science*, *18*(5), e70225. https://doi.org/10.1111/cts.70225							*and CYP3A5*		
Ferrari, M., Guasti, L., Maresca, A., Mirabile, M., Contini, S., Grandi, A. M., Marino, F., & Cosentino, M. (2014). Association between statin-induced creatine kinase elevation and genetic polymorphisms in *SLCO1B1*, *ABCB1* and *ABCG2*. *European journal of clinical pharmacology*, *70*(5), 539–547. https://doi.org/10.1007/s00228-014-1661-6	yes	qPCR	33	33	Italian	Rosuvastatin Atorvastatin Simvastatin	*SLCO1B1* A388G and *SLCO1B1* T521C, *ABCB1* C1236T and *ABCB1* C3435T and *ABCG2* C421A	elevated serum CK levels	*SLCO1B1* T521C and *ABCB1* C1236T were associated with increased risk of statin-induced CK elevation, while *SLCO1B1* A388G was associated with reduced risk of statin-induced CK elevation.
Mirošević Skvrce, N., Macolić Šarinić, V., Šimić, I., Ganoci, L., Muačević Katanec, D., & Božina, N. (2015). *ABCG2* gene polymorphisms as risk factors for atorvastatin adverse reactions: a case-control study. *Pharmacogenomics*, *16*(8), 803–815. https://doi.org/10.2217/pgs.15.47	yes	qPCR	60	90	Croatian	Atorvastatin	*ABCG2* 421C > A, *CYP3A4**22, *SLCO1B1* 388A > G, *SLCO1B1* 521T > C variants	Myotoxicity and hepatotoxicity	*ABCG2* 421CA/AA and *SLCO1B1* 521TC/CC were associated with increased risk of atorvastatin-induced ADRs.
Zakria, M., Hussain, A., Ahmad, N., Ahmed, N., Rauf, M. A., & Siraj, S. (2023). The lipid-lowering efficacy of rosuvastatin is associated with variations in *SLCO1B1*: a 12-month prospective cohort study. *European review for medical and pharmacological sciences*, *27*(10), 4708–4717. https://doi.org/10.26355/eurrev_202305_32483	yes	sequencing	166		Pakistani	Rosuvastatin	*SLCO1B1* rs4149056, rs2306283	SAMS, reduced lipid-lowering efficacy, and increased rosuvastatin exposure	*SLCO1B1* c.521T>C and c.388A>G were associated with reduced LDL-C-lowering efficacy, higher rosuvastatin plasma levels, and greater incidence of SAMS.

Haldar, T., Kvale, M., Yang, J., Douglas, M. P., Coyote-Maetas, W., Kachuri, L., Witte, J. S., Iribarren, C., Medina, M. W., Krauss, R. M., Yee, S. W., & Oni-Orisan, A. (2025). *SLCO1B1* Functional Variants, Bilirubin, Statin-Induced Myotoxicity, and Recent Sub-Saharan African Ancestry: A Precision Medicine Health Equity Study. *Clinical pharmacology and therapeutics*, *117*(6), 1696–1705. https://doi.org/10.1002/cpt.3624	NR	Array	578	5828	Black and White population	Not specified (multiple statins; heterogeneous use)	*SLCO1B1* rs59502379, rs77271279 and rs4149056	SAMS	In Black patients, *SLCO1B1* rs59502379 was associated with severe statin-induced myotoxicity, whereas rs77271279 and rs4149056 were associated with elevated bilirubin only; in White patients these variants were rare or not analysable
Liu, J. E., Liu, X. Y., Chen, S., Zhang, Y., Cai, L. Y., Yang, M., Lai, W. H., Ren, B., & Zhong, S. L. (2017). *SLCO1B1* 521T > C polymorphism associated with rosuvastatin-induced myotoxicity in Chinese coronary artery disease patients: a nested case-control study. *European journal of clinical pharmacology*, *73*(11), 1409–1416. https://doi.org/10.1007/s00228-017-2318-z	yes	PCR	148	255	Chinese	Simvastatin Atorvastatin	*CYP3A5, SLCO1B1,* and *APOE* variants	statin-induced myotoxicity	*SLCO1B1* (rs4149056) is associated with statin-induced myotoxicity in Chinese patients, in addition *SLCO1B1* 521C mutant allele increased the risk of rosuvastatin-associated myotoxicity. However, non significant association was observed between 521C mutant allele and risk of myotoxicity in patients that received atorvastatin and simvastatin.
Sharif, M., Farhat, K., Noor, M., Siddique, M. B., Tariq, A., & Afzal, R. K. (2025). Effect of genetic polymorphism of rosuvastatin transporter gene rs2231137 on its clinical efficacy and safety. *Scientific reports*, *15*(1), 38811. https://doi.org/10.1038/s41598-025-22763-z	yes	ARMS-PCR	384		Pakistani	Rosuvastatin	*ABCG2* 34 C > T	increased rosuvastatin exposure, myopathy and hepatotoxicity	The *ABCG2* 34C>T variant was associated with higher rosuvastatin plasma levels, greater lipid-lowering efficacy, and an increased risk of rosuvastatin-related adverse effects compared with the wild-type genotype.
Zhang, L., Lv, H., Zhang, Q., Wang, D., Kang, X., Zhang, G., & Li, X. (2019). Association of *SLCO1B1* and *ABCB1* Genetic Variants with Atorvastatin-induced Myopathy in Patients with Acute Ischemic Stroke. *Current pharmaceutical design*, *25*(14),	NR	Array	61	110	China	Atorvastatin	*ABCB1, CoQ2, HTR3B, RYR2, CYP3A5, HTR7* and *SLCO1B1*	Myopathy	*ABCB1* rs2373588 was positively associated with increased risk of statin-induced myopathy, while *SLCO1B1* rs976754 showed an inverse association, suggesting a protective effect. No other SNPs were significantly associated.

1663–1670. https://doi.org/10.2174/1381612825666190705204614									
Wagner, J. B., Abdel-Rahman, S., Raghuveer, G., Gaedigk, A., Boone, E. C., Gaedigk, R., Staggs, V. S., Reed, G. A., Zhang, N., & Leeder, J. S. (2024). *SLCO1B1* Genetic Variation Influence on Atorvastatin Systemic Exposure in Pediatric Hypercholesterolemia. *Genes*, *15*(1), 99. https://doi.org/10.3390/genes15010099	NR	qPCR	28		USA	Atorvastatin	*SLCO1B1* rs4149056	increased atorvastatin exposure	*SLCO1B1* c.521T>C significantly increases systemic exposure to atorvastatin in pediatric patients
Elam, M. B., Majumdar, G., Mozhui, K., Gerling, I. C., Vera, S. R., Fish-Trotter, H., Williams, R. W., Childress, R. D., & Raghow, R. (2017). Patients experiencing statin-induced myalgia exhibit a unique program of skeletal muscle gene expression following statin re-challenge. *PloS one*, *12*(8), e0181308. https://doi.org/10.1371/journal.pone.0181308	NR	Array	16	10	European descent (just male)	Simvastatin Atorvastatin Rosuvastatin Pravastatin	*SLCO1B1, SLCO2B1, ABCC1, ABCB1, CoQ2, RYR2, HTR3B, HTR7* and *GATM*	Myalgia (muscle pain, weakness and cramping)	Increased frequencies of *SLCO1B1* rs4149056, SLCO2B1 rs12422149 and RYR2 rs2819742 were observed in patients with statin-associated myalgia, while *ABCB1* rs1128503 and *SLCO1B1* rs4149056 have been linked to reduced and increased risk of statin-induced myalgia and myositis, respectively.
Sai, K., Kajinami, K., Akao, H., Iwadare, M., Sato-Ishida, R., Kawai, Y., Takeda, K., Tanimoto, T., Yamano, T., Akasaka, T., Ishida, T., Hirata, K. I., Saku, K., Yagi, S., Soeki, T., Sata, M., Ueno, M., Miyazaki, S., Shiraki, A., Oyama, J. I., … Saito, Y. (2016). A possible role for HLA-DRB1*04:06 in statin-related myopathy in Japanese patients. *Drug metabolism and pharmacokinetics*, *31*(6), 467–470. https://doi.org/10.1016/j.dmpk.2016.09.002	NR	qPCR	52	2878+86	Japanese population	Atorvastatin Rosuvastatin Pitavastatin Pravastatin Fluvastatin Simvastatin	*SLCO1B1 rs4149056, RYR2 rs2819742,* and *GATM rs9806699, HLA-DRB1*04:06*	Statin-related myopathy (SRM)	No significant associations were found for RYR2, *SLCO1B1*, or GATM variants with SRM; however, HLA-DRB1*04:06 showed a significant association with SRM.

Brunham, L. R., Lansberg, P. J., Zhang, L., Miao, F., Carter, C., Hovingh, G. K., Visscher, H., Jukema, J. W., Stalenhoef, A. F., Ross, C. J., Carleton, B. C., Kastelein, J. J., & Hayden, M. R. (2012). Differential effect of the rs4149056 variant in *SLCO1B1* on myopathy associated with simvastatin and atorvastatin. *The pharmacogenomics journal*, *12*(3), 233–237. https://doi.org/10.1038/tpj.2010.92	NR	Array	25	84	Netherland	Simvastatin Atorvastatin Rosuvastatin Pravastatin	*SLCO1B1* rs4149056	Myopathy	The rs4149056 variant in *SLCO1B1* was not significantly associated with myopathy in this group as a whole. However, the *SLCO1B1* rs4149056 genotype was significantly associated with myopathy in patients who received simvastatin, but not in patients who received atorvastatin. The cohort of patients treated with rosuvastatin and pravastatin was too small to draw firm conclusions.
Tornio, A., Vakkilainen, J., Neuvonen, M., Backman, J. T., Neuvonen, P. J., & Niemi, M. (2015). *SLCO1B1* polymorphism markedly affects the pharmacokinetics of lovastatin acid. *Pharmacogenetics and genomics*, *25*(8), 382–387. https://doi.org/10.1097/FPC.0000000000000148	NR	PCR	27		Finish population	Lovastatin	*CYP3A4*22* and *CYP2D6*	Increased lovastatin exposure	It is probable that the risk of muscle toxicity during lovastatin treatment is increased in individuals carrying the *SLCO1B1**5 or *15 allele. The *SLCO1B1**1B/*1B genotype is associated with reduced lovastatin acid concentrations
Bai, X., Zhang, B., Wang, P., Wang, G. L., Li, J. L., Wen, D. S., Long, X. Z., Sun, H. S., Liu, Y. B., Huang, M., & Zhong, S. L. (2019). Effects of *SLCO1B1* and GATM gene variants on rosuvastatin-induced myopathy are unrelated to high plasma exposure of rosuvastatin and its metabolites. *Acta pharmacologica Sinica*, *40*(4), 492–499. https://doi.org/10.1038/s41401-018-0013-y	yes	Array	758		Chinese patient	Rosuvastatin	*ABCG2, ABCB1, SLCO1B1, CYP2C9* and *GATM*	Myopathy	*ABCG2* rs2231142 was highly associated with the plasma concentrations of rosuvastatin and its metabolites; CYP2C9 rs1057910 affects N-desmethyl rosuvastatin levels. *SLCO1B1* rs4149056 is significantly associated with increased myopathy risk, while GATM rs9806699 shows a marginal protective effect.
Becker, M. L., Elens, L. L., Visser, L. E., Hofman, A., Uitterlinden, A. G., van Schaik, R. H., & Stricker, B. H. (2013). Genetic variation in the *ABCC2* gene is associated with dose decreases or switches to other cholesterol-	yes	Array	1014		Caucasian	Simvastatin Atorvastatin	*ABCC2* -24C>T, 1249G>A and 3972C>T	dose reduction or drug switch	*ABCC2* polymorphisms (-24C>T and H12 haplotype) were significantly associated with dose reduction or switching in simvastatin users, suggesting a link to statin intolerance. A similar but non-significant trend was observed in atorvastatin users.

lowering drugs during simvastatin and atorvastatin therapy. *The pharmacogenomics journal*, *13*(3), 251–256. https://doi.org/10.1038/tpj.2011.59									
Marciante, K. D., Durda, J. P., Heckbert, S. R., Lumley, T., Rice, K., McKnight, B., Totah, R. A., Tamraz, B., Kroetz, D. L., Fukushima, H., Kaspera, R., Bis, J. C., Glazer, N. L., Li, G., Austin, T. R., Taylor, K. D., Rotter, J. I., Jaquish, C. E., Kwok, P. Y., Tracy, R. P., … Psaty, B. M. (2011). Cerivastatin, genetic variants, and the risk of rhabdomyolysis. *Pharmacogenetics and genomics*, *21*(5), 280–288. https://doi.org/10.1097/FPC.0b013e328343dd7d	yes	PCR and Sequencing	185	732	USA	Cerivastatin	*CYP2C8*, *UGT1A1*, *UGT1A3*, and *SLCO1B1* and GWAS	Rhabdomyolysis	A significant association between cerivastatin-induced rhabdomyolysis and the *SLCO1B1* rs4149056 variant was observed, whereas CYP2C8 and UGT1A1/UGT1A3 showed no effect. The GWAS also identified RYR2 rs2819742 as protective, lowering the risk of rhabdomyolysis
Santos, P. C., Gagliardi, A. C., Miname, M. H., Chacra, A. P., Santos, R. D., Krieger, J. E., & Pereira, A. C. (2012). *SLCO1B1* haplotypes are not associated with atorvastatin-induced myalgia in Brazilian patients with familial hypercholesterolemia. *European journal of clinical pharmacology*, *68*(3), 273–279. https://doi.org/10.1007/s00228-011-1125-1	yes	PCR	14	129	Brazilian	Atorvastatin	*SLCO1B1* rs2306283 and rs4149056	Myalgia	No association of the *SLCO1B1* rs2306283 and rs4149056 genotypes or haplotypes with the presence of myalgia or creatine kinase (CK) values was found.
Hoenig, M. R., Walker, P. J., Gurnsey, C., Beadle, K., & Johnson, L. (2011). The C3435T polymorphism in *ABCB1* influences atorvastatin efficacy and muscle symptoms in a high-risk vascular cohort. *Journal of clinical lipidology*, *5*(2), 91–96.	yes	Array	117		Australia	Atorvastatin	*ABCB1* C3435T	Myalgia	the CC genotype at the *ABCB1* C3435T polymorphism was associated with reduced drug efficacy. Additionally, the T allele was more frequent among patients who reported myalgia, suggesting a possible link between *ABCB1* variants and statin-induced muscle symptoms.

https://doi.org/10.1016/j.jacl.2011.01.001									
Ruaño, G., Thompson, P. D., Windemuth, A., Seip, R. L., Dande, A., Sorokin, A., Kocherla, M., Smith, A., Holford, T. R., & Wu, A. H. (2007). Physiogenomic association of statin-related myalgia to serotonin receptors. *Muscle & nerve*, *36*(3), 329–335. https://doi.org/10.1002/mus.20871	NR	Array	39	144	Caucasian	Atorvastatin Simvastatin Pravastatin	Serotonergic genes variants	Myalgia	Variants in serotonergic genes (HTR3B rs2276307 and HTR7 rs1935349) were associated with statin-induced myalgia, suggesting that genetic differences in pain perception may influence susceptibility to this adverse reaction.
Zuccaro, P., Mombelli, G., Calabresi, L., Baldassarre, D., Palmi, I., & Sirtori, C. R. (2007). Tolerability of statins is not linked to CYP450 polymorphisms, but reduced CYP2D6 metabolism improves cholesteraemic response to simvastatin and fluvastatin. *Pharmacological research*, *55*(4), 310–317. https://doi.org/10.1016/j.phrs.2006.12.009	NR	PCR	50	50	Italian	Several statins	*CYP2D6* *Apo* E	Myopathy	None of the assessed CYP450 polymorphisms appeared to be related to an increased incidence of myopathy. Although CYP2D6 *1/*4 and *4/4* poor metabolizer status was associated to a higher efficacy of statins metabolized by this system and, in addition, the apo E2 genotype was, in this series, linked to increased HDL-C levels after therapy
Sharif, M., Farhat, K., Noor, M., Ahmad, A. M., Khan, D. A., Afzal, R. K., & Siddique, M. B. (2025). Association of *ABCG2* 421G>T (rs2231142) Polymorphism with rosuvastatin induced adverse effects in dyslipidemic patients: Implication for personalized medicine. *PloS one*, *20*(10), e0334600. https://doi.org/10.1371/journal.pone.0334600	yes	PCR	4630		Pakistan	Rosuvastatin	*ABCG2* rs2231142	Myopathy and elevated rosuvastatin plasma exposure	Patients having T variant allele (*ABCG2* rs2231142) is associated with higher plasma rosuvastatin concentration and increased the risk of development of adverse effects compared with G allele carriers

Ovesjö, M. L., Skilving, I., Bergman, P., Rane, A., Ekström, L., & Björkhem-Bergman, L. (2016). Low Vitamin D Levels and Genetic Polymorphism in the Vitamin D Receptor are Associated with Increased Risk of Statin-Induced Myopathy. *Basic & clinical pharmacology & toxicology*, *118*(3), 214–218. https://doi.org/10.1111/bcpt.12482	yes	PCR	16	111	Swedish	Several statins	*Vitamin D receptor TaqI* rs731236	myopathy	VDR polymorphism TaqI was associated with myopathy
Miroševic Skvrce, N., Božina, N., Zibar, L., Barišic, I., Pejnovic, L., & Macolic Šarinic, V. (2013). CYP2C9 and *ABCG2* polymorphisms as risk factors for developing adverse drug reactions in renal transplant patients taking fluvastatin: a case-control study. *Pharmacogenomics*, *14*(12), 1419–1431. https://doi.org/10.2217/pgs.13.135	yes	qPCR	52	52	Croatian	Fluvastatin	*CYP2C9*2, *3* and *ABCG2* 421C>A	fluvastatin-induced myotoxicity and hepatoxicity	Fluvastatin-induced adverse reactions in renal transplant recipients were associated with genetic variants in CYP2C9 (*2 and *3) and *ABCG2* (421C>A)
Wilke, R. A., Moore, J. H., & Burmester, J. K. (2005). Relative impact of CYP3A genotype and concomitant medication on the severity of atorvastatin-induced muscle damage. *Pharmacogenetics and genomics*, *15*(6), 415–421. https://doi.org/10.1097/01213011-200506000-00007	yes	sequencing	68	69	EEUU	Atorvastatin	*CYP3A4*1B* or *CYP3A5*3*	myalgia	CYP3A genotype was not associated with increased risk of atorvastatin-induced muscle damage, but *CYP3A5**3 homozygosity correlated with greater CK elevation and severity of myopathy.
Ruaño, G., Windemuth, A., Wu, A. H., Kane, J. P., Malloy, M. J., Pullinger, C. R., Kocherla, M., Bogaard, K., Gordon, B. R., Holford, T. R., Gupta, A., Seip, R. L., & Thompson, P. D. (2011). Mechanisms of statin-induced myalgia assessed by physiogenomic associations. *Atherosclerosis*, *218*(2), 451–456.	NR	Array	377	146	US	NR	Several	myalgia	COQ2 (rs4693570), ATP2B1 (rs17381194), and DMPK (rs672348) variants were significantly associated with statin-induced myalgia, validating their role as genetic markers for muscle-related ADRs.

https://doi.org/10.1016/j.atherosclerosis.2011.07.007									
Nicoletti, P., Aithal, G. P., Bjornsson, E. S., Andrade, R. J., Sawle, A., Arrese, M., Barnhart, H. X., Bondon-Guitton, E., Hayashi, P. H., Bessone, F., Carvajal, A., Cascorbi, I., Cirulli, E. T., Chalasani, N., Conforti, A., Coulthard, S. A., Daly, M. J., Day, C. P., Dillon, J. F., Fontana, R. J., … International Drug-Induced Liver Injury Consortium, Drug-Induced Liver Injury Network Investigators, and International Serious Adverse Events Consortium (2017). Association of Liver Injury From Specific Drugs, or Groups of Drugs, With Polymorphisms in HLA and Other Genes in a Genome-Wide Association Study. *Gastroenterology*, *152*(5), 1078–1089. https://doi.org/10.1053/j.gastro.2016.12.016	NR	Array	862	10588	European, American and South American	Atorvastatin Pravastatin Fluvastatin Rosuvastatin Lovastatin Simvastatin	GWAS	drug-induced liver injury (DILI)	rs116561224 (located on chromosome 18) allele G is associated with increased risk of drug-induced liver injury when treated with HMG-CoA reductase inhibitors as compared to allele A.,
Isackson, P. J., Ochs-Balcom, H. M., Ma, C., Harley, J. B., Peltier, W., Tarnopolsky, M., Sripathi, N., Wortmann, R. L., Simmons, Z., Wilson, J. D., Smith, S. A., Barboi, A., Fine, E., Baer, A., Baker, S., Kaufman, K., Cobb, B., Kilpatrick, J. R., & Vladutiu, G. D. (2011). Association of common variants in the human eyes shut ortholog (EYS) with statin-induced myopathy: evidence for additional functions of EYS. *Muscle &*	yes (after excluding rs9351261, rs13217762)	Array	190	130	American, Canadian and Australian	Mostly atorvastatin; also simvastatin, rosuvastatin, pravastatin, cerivastatin	*EYS* rs9342288, rs1337512, and rs3857532	Severe statin-induced myopathy (severe myalgia/weakness ± CK elevation)	Variants rs9342288, rs1337512, and rs3857532 in the EYS gene were associated with increased risk of severe statin-induced myopathy

nerve, *44*(4), 531–538. https://doi.org/10.1002/mus.22115									
Giannakopoulou, E., Ragia, G., Kolovou, V., Tavridou, A., Tselepis, A. D., Elisaf, M., Kolovou, G., & Manolopoulos, V. G. (2014). No impact of *SLCO1B1* 521T>C, 388A>G and 411G>A polymorphisms on response to statin therapy in the Greek population. *Molecular biology reports*, *41*(7), 4631–4638. https://doi.org/10.1007/s11033-014-3334-z	yes	PCR	386		Greek	Atorvastatin Simvastatin	*SLCO1B1* rs2306283, rs4149056 and rs7176204	Reduced lipid-lowering response	No association was found between *SLCO1B1* variants (521T>C, 388A>G, 411G>A) and lipid-lowering response to atorvastatin or simvastatin
Al-Salameh, A., Danchin, N., Verstuyft, C., Kotti, S., Puymirat, E., Ferrières, J., Schiele, F., Coste, P., Lemesle, G., Cayla, G., Becquemont, L., & Simon, T. (2020). Association between rs4149056 variant in *SLCO1B1* and early discontinuation of statin after acute myocardial infarction. *Pharmacogenomics*, *21*(3), 163–172. https://doi.org/10.2217/pgs-2019-0109	yes	qPCR	1674	1708	French	Rosuvastatin Atorvastatin Simvastatin Pravastatin Fluvastastin	*SLCO1B1* rs4149056	statin discontinuation	*SLCO1B1* rs4149056 was associated with increased risk of in-hospital statin discontinuation in 2005, but not in 2010, so *SLCO1B1* rs4149056 does not appear to be a major determinant of early in-hospital statin discontinuation after acute myocardial infarction
Donnelly, L. A., Doney, A. S., Tavendale, R., Lang, C. C., Pearson, E. R., Colhoun, H. M., McCarthy, M. I., Hattersley, A. T., Morris, A. D., & Palmer, C. N. (2011). Common nonsynonymous substitutions in *SLCO1B1* predispose to statin intolerance in routinely treated individuals with type 2 diabetes: a	yes	qPCR	1275	816	Scotland	several statins	*SLCO1B1* rs4149056 and rs2306283	Intolerance, defined by serum biochemistry and also by discontinuation, switching, or reduction in dose of the prescribed statin drug	*SLCO1B1* rs4149056 was associated with higher statin intolerance in patients with type 2 diabetes, whereas s2306283 was associated with lower intolerance

go-DARTS study. *Clinical pharmacology and therapeutics*, *89*(2), 210–216. https://doi.org/10.1038/clpt.2010.255									
Voora, D., Shah, S. H., Spasojevic, I., Ali, S., Reed, C. R., Salisbury, B. A., & Ginsburg, G. S. (2009). The *SLCO1B1**5 genetic variant is associated with statin-induced side effects. *Journal of the American College of Cardiology*, *54*(17), 1609–1616. https://doi.org/10.1016/j.jacc.2009.04.053	yes	sequencing	99	353	USA	atorvastatin, simvastatin, or pravastatin	*CYP2D6*4*10, CYP2C8*3*4, CYP2C9*3, CYP3A4*1b*, and *SLCO1B1*5*	Composite adverse event (CAE) as discontinuation for any side effect, myalgia, or CK >3x upper limit of normal	Carriers of the reduced function allele (*5) of the organic acid transporter *SLCO1B1* and females were at higher risk of developing CAE
Murphy, W. A., Lin, N., Damask, A., Schwartz, G. G., Steg, P. G., Szarek, M., Banerjee, P., Fazio, S., Manvelian, G., Pordy, R., Shuldiner, A. R., & Paulding, C. (2022). Pharmacogenomic Study of Statin-Associated Muscle Symptoms in the ODYSSEY OUTCOMES Trial. *Circulation. Genomic and precision medicine*, *15*(3), e003503. https://doi.org/10.1161/CIRCGEN.121.003503	yes	sequencing	894/9630	9723	White, asian, black and other/unknown	Atorvastatin Rosuvastatin	*TMEM9, ABCB1, CKM, COQ2, HTR3B, HTR7, LILRBR5, LINC00393, RYR2, SLCO1B1*	Statin-associated muscle symptoms	TMEM9 (rs6667912) was associated with patients with clinical SAMS
DeGorter, M. K., Tirona, R. G., Schwarz, U. I., Choi, Y. H., Dresser, G. K., Suskin, N., Myers, K., Zou, G., Iwuchukwu, O., Wei, W. Q., Wilke, R. A., Hegele, R. A., & Kim, R. B. (2013). Clinical and pharmacogenetic predictors of circulating atorvastatin and rosuvastatin concentrations in routine clinical care. *Circulation. Cardiovascular genetics*, *6*(4), 400–408.	yes	PCR	299		White	Atorvastatin and rosuvastatin	*SLCO1B1* (rs2306283, rs4149056), *SLCO1B3* (rs7311358), *SLCO2B1* (rs12422149), *ABCB1* (rs1045642), *ABCC2*	Elevated statin exposure	Carriers of *SLCO1B1* c.521T>C and *ABCG2* c.421C>A had higher rosuvastatin exposure. Carriers of c.521T>C had higher atorvastatin concentration.

https://doi.org/10.1161/CIRCGENETICS.113.000099							(rs2273697), and *ABCG2* (rs2231142) *CYP3A4* rs3559936 *CYP3A5* rs776746 *CYP2C9* *2 *CYP2C9**3		
Hubacek, J. A., Adamkova, V., Zlatohlavek, L., Steiner-Mrazova, L., & Vrablik, M. (2017). COQ2 polymorphisms are not associated with increased risk of statin-induced myalgia/myopathy in the Czech population. *Drug metabolism and personalized therapy*, *32*(4), 177–182. https://doi.org/10.1515/dmpt-2017-0027	yes	PCR-RFLP	278+293	561	Czech	Atrovastatin Simvastatin	*COQ2* rs6535454 rs4693075	Statin-associated muscle symptoms	The polymorphisms of the COQ2 gene did not associated with SAMS
K Siddiqui, M., Maroteau, C., Veluchamy, A., Tornio, A., Tavendale, R., Carr, F., Abelega, N. U., Carr, D., Bloch, K., Hallberg, P., Yue, Q. Y., Pearson, E. R., Colhoun, H. M., Morris, A. D., Dow, E., George, J., Pirmohamed, M., Ridker, P. M., Doney, A. S. F., Alfirevic, A., … PREDICTION-ADR Consortium (2017). A common missense variant of LILRB5 is associated with statin intolerance and myalgia. European heart journal, 38(48), 3569–3575. https://doi.org/10.1093/eurheartj/ehx467	NR	Array	588+356	591+443	Scottish and caucasian	Not specificated	*LILRB5* rs12975366	Statin intolerance (CK raised above the ULN, after start of statin therapy, statin switching or discontinuation)	LILRB5 Asp247 homozygous genotype is associated with increased risk of outcomes associated with statin intolerance

Danik, J. S., Chasman, D. I., MacFadyen, J. G., Nyberg, F., Barratt, B. J., & Ridker, P. M. (2013). Lack of association between *SLCO1B1* polymorphisms and clinical myalgia following rosuvastatin therapy. *American heart journal*, *165*(6), 1008–1014. https://doi.org/10.1016/j.ahj.2013.01.025	NR	Array	4404	4378	USA	Rosuvastatin	*SLCO1B1* (rs4363657 and rs4149056)	Musculoskeletal adverse events	No increased risk of myalgia among users of rosuvastatin who carry the rs4363657C or the rs4149056C allele in *SLCO1B1*.
SEARCH Collaborative Group, Link, E., Parish, S., Armitage, J., Bowman, L., Heath, S., Matsuda, F., Gut, I., Lathrop, M., & Collins, R. (2008). *SLCO1B1* variants and statin-induced myopathy--a genomewide study. *The New England journal of medicine*, *359*(8), 789–799. https://doi.org/10.1056/NEJMoa0801936	yes	Array and PCR	85	90	British	Simvastatin	*SLCO1B1*	Musculoskeletal adverse events	*SLCO1B1* rs4149056 is associated with an increased risk of statin-induced myopathy
Keskitalo, J. E., Zolk, O., Fromm, M. F., Kurkinen, K. J., Neuvonen, P. J., & Niemi, M. (2009). *ABCG2* polymorphism markedly affects the pharmacokinetics of atorvastatin and rosuvastatin. *Clinical pharmacology and therapeutics*, *86*(2), 197–203. https://doi.org/10.1038/clpt.2009.79	yes	qPCR	660		Finish population	Atorvastatin and rosuvastatin	*ABCG2* c.421C>A	Elevated atorvastatin and rosuvastatin exposure	*ABCG2* c.421A carriers had higher systemic exposure for atorvastatin and rosuvastatin
Wang, Y., Tian, Y., Lv, P., Chen, L., Luo, W., Jing, X., Li, H., Tan, Z., Wang, Y., Zhou, H., & Ouyang, D. S. (2017). The effect of *SLCO1B1* polymorphism on the pharmacokinetics of atorvastatin and 2-hydroxyatorvastatin in healthy Chinese people. *Die Pharmazie*, *72*(6), 365–368.	yes	Array	132		Chinese population	Atorvastatin	*SLCO1B1* c.521T>C (rs4149056)	Elevated atorvastatin exposure	Subjects with *SLCO1B1* 521C allele have an increased risk of toxic effects caused by atorvastatin

https://doi.org/10.1691/ph.2017.6944									
McLean, C. C., Teft, W. A., Morse, B. L., Gryn, S. E., Hegele, R. A., & Kim, R. B. (2018). Food Effect on Rosuvastatin Disposition and Low-Density Lipoprotein Cholesterol. *Clinical pharmacology and therapeutics*, *104*(3), 525–533. https://doi.org/10.1002/cpt.973	NR	PCR	23		Canadian volunteers of European and Asian descent	Rosuvastatin	*SLCO1B1* c.388A>G *SLCO1B1* c.521T>C, *ABCG2* c.421C>A *ABCG2* c.34G>A	Elevated rosuvastatin exposure	*ABCG2* c.421C>A was related to high rosuvastatin exposure
Turner, R. M., Fontana, V., Zhang, J. E., Carr, D., Yin, P., FitzGerald, R., Morris, A. P., & Pirmohamed, M. (2020). A Genome-wide Association Study of Circulating Levels of Atorvastatin and Its Major Metabolites. *Clinical pharmacology and therapeutics*, *108*(2), 287–297. https://doi.org/10.1002/cpt.1820	yes	Array	590	149	British	Atorvastatin	GWAS	Elevated atorvastatin exposure and SAMS	The UGT1A1 rs887829 and CYP3A7*1C were associated to higher atorvastatin metabolites concentration and *SLCO1B1* rs4149056 with higher atorvastatin levels and increased muscular symptoms.
Willis, B. A., Andersen, S. W., Ayan-Oshodi, M., James, D. E., Liffick, E., Hillgren, K., Guo, Y., & Monk, S. A. (2020). Assessment of Transporter Polymorphisms as a Factor in a BCRP Drug Interaction Study With Lanabecestat. *Journal of clinical pharmacology*, *60*(1), 107–116. https://doi.org/10.1002/jcph.1500	NR	qPCR and sequencing	42		White	Rosuvastatin	*SLCO1B1*, *ABCB1*, *ABCG2*, *ABCC2*, SLCO1B3, SLC10A1, SLCO2B1, SLCO2B1	Elevated rosuvastatin exposure	Heterozygotes of *ABCG2* c.421C>A (rs2231142) had approximately higher levels of rosuvastatin AUC relative to the CC genotype
Lenuzza, N., Duval, X., Nicolas, G., Thévenot, E., Job, S., Videau, O., Narjoz, C., Loriot, M. A., Beaune, P., Becquemont, L., Mentré, F., Funck-Brentano, C., Alavoine, L., Arnaud, P., Delaforge, M., & Bénech, H. (2016). Safety and pharmacokinetics of the CIME combination of drugs and their metabolites after a single oral dosing in healthy volunteers. *European*	NR	PCR	10		Caucasian	Rosuvastatin	OATP1B1 OATP1B3 (and other genes no related to statins)	Elevated rosuvastatin exposure	Polymorphisms of SLCOB1 were not related to effect on rosuvastatin AUC

journal of drug metabolism and pharmacokinetics, *41*(2), 125–138. https://doi.org/10.1007/s13318-014-0239-0									
Farooq, T., Naeem, U., Siddique, A., Kausar, S., Waheed, A., & Mumal, S. (2025). Impact of *SLCO1B1* (rs2306283) polymorphism on personalized atorvastatin dosing in a genetically distinct South Asian cohort. BMC pharmacology & toxicology, 26(1), 189. https://doi.org/10.1186/s40360-025-01022-x	NR	ARMS-PCR	100		Pakistani	Ator	*SLCO1B1* rs2306283	reduced lipid-lowering efficacy and SAMS	no association was observed between *SLCO1B1* rs2306283 polymorphism and lipid-lowering efficacy although the G allele demonstrated a myopathy protective effect
Alqasrawi, M. N., Al-Mahayri, Z. N., AlBawa'neh, A. S., Khasawneh, L. Q., Dabaghie, L., Altoum, S. M., Hamza, D., Misra, V., Ouda, H., Aburuz, S., Al-Maskari, F., AlKaabi, J., Patrinos, G. P., & Ali, B. R. (2025). Pharmacogenomic insights into atorvastatin and rosuvastatin adverse effects: a prospective observational study in the UAE's multiethnic population. Human genomics, 19(1), 44. https://doi.org/10.1186/s40246-025-00753-6	NR	qPCR and sequencing	675		Multiethnic	Rosuvastatin Atorvastatin	*SLCO1B1* and *ABCG2*	SAMS and liver enzyme elevation	*ABCG2* rs2231142 increases the risk of liver enzyme elevation with rosuvastatin, *SLCO1B1* rs4149056 increases the risk of SAMS with atorvastatin, and rosuvastatin–ezetimibe co-therapy further increases the risk of SAMS and liver enzyme elevation.
Ahmed Feldman, M., Billman, K., Sennoun, M., Ng, G., Hussain, M., Schlosser, E. G., Hincapie, A. L., & Allen, J. D. (2025). Retrospective Evaluation of the Impact of *SLCO1B1* Variation on Statin Effectiveness. *Journal of personalized medicine*, *15*(11), 511. https://doi.org/10.3390/jpm15110511	NR	na	213		USA	NR	*SLCO1B1* rs4149056	LDL-C reduction, SAMS, Statin Adherence	No significant difference in LDL-C reduction, SAMS occurrence or statin adherence was observed between *SLCO1B1* phenotypes

Lauritzen, T., Munkhaugen, J., Bergan, S., Peersen, K., Svarstad, A. C., Andersen, A. M., Pahnke, J., Husebye, E., & Vethe, N. T. (2024). The atorvastatin metabolite pattern in muscle tissue and blood plasma is associated with statin muscle side effects in patients with coronary heart disease; An exploratory case-control study. Atherosclerosis plus, 55, 31–38. https://doi.org/10.1016/j.athplu.2024.01.001	NR	qPCR and Array	4	24	Norway	Atorvastatin	*SLCO1B1* rs4149056, SLCO2B1 rs12422149, UGT1A3 rs2008584, rs1983023, rs45449995 and UGT1A1 rs887829	Increased atorvastatin lactone metabolite levels	No consistent association between the lactone/ acid ratios and the gene variants in *SLCO1B1* and SLCO2B1 was observed, however, there was a tendency towards lower lactone/acid ratios in muscle tissue from patients with the *SLCO1B1* c.521T > C variant (heterozygotes). Variants in UGT1A1 and UGT1A3 were associated with increased atorvastatin lactone metabolite levels in muscle and plasma, a pattern linked to statin-associated muscle symptoms.
Park, Y. A., Chang, Y., Lee, D. H., Kim, J. S., Park, M., Choi, S. A., Song, T. J., & Gwak, H. S. (2024). Association between coenzyme Q 10-related genetic polymorphisms and statin-associated myotoxicity in Korean stroke patients. Frontiers in pharmacology, 15, 1358567. https://doi.org/10.3389/fphar.2024.1358567	NR	qPCR	56	632	Korean	Atorvastatin Rosuvastatin Pitavastatin Pravastatin Simvastatin	COQ2, COQ3, COQ5, COQ6, and COQ7	Statin-related myopathy (SRM)	Patients with COQ2 rs4693075 G allele, COQ3 rs11548336 TT genotype, and COQ5 rs10849757 A allele had higher SRM risk
Melhem, A. L., Chourasia, M. K., Bigossi, M., Maroteau, C., Taylor, A., Pola, R., Dawed, A. Y., Tornio, A., Palmer, C. N. A., & Siddiqui, M. K. (2021). Common Statin Intolerance Variants in *ABCB1* and *LILRB5* Show Synergistic Effects on Statin Response: An Observational Study Using Electronic Health Records. *Frontiers in genetics*, *12*, 713181. https://doi.org/10.3389/fgene.2021.713181	yes	na	9401		Scotland	Atorvastatin Simvastatin	*ABCB1* rs1128503 and rs1045642, *SLCO1B1* rs4149056 and rs2306283, LILRB5 rs12975366, *CYP3A4* rs2740574, and *CYP3A5* rs776746	non-HDL-cholesterol lowering efficacy	*ABCB1* (rs1045642) and LILRB5 (rs12975366) variants were associated with greater reduction in non-HDL-cholesterol in simvastatin/atorvastatin users. Other selected variants did not show any significant association with change in non-HDL-C response

Shahrure, Z. M., Irshaid, Y. M., Mustafa, K. N., Abujbara, M. A., Al Shhab, M., El-Khateeb, M. S., & Ajlouni, K. M. (2021). *SLCO1B1* Gene Polymorphisms (rs2306283 and rs4149056) and Statin-Induced Myopathy in Jordanian Diabetics. Current reviews in clinical and experimental pharmacology, 16(3), 281–288. https://doi.org/10.2174/1574884715666200827105612	yes	ARMS-PCR	72(sam+statin)+199(statin)	142 (not statin)	Jordanian	Atorvastatin Simvastatin Rosuvastatin Pravastatin	*SLCO1B1* rs2306283 and rs4149056	Myopathy defined as the elevation of creatine kinase >3ULN	Myopathy was significantly associated with the homozygous and heterozygous minor allele genotype of *SLCO1B1* rs4149056 the homozygous wild type allele genotype of rs2306283
Zubiaur, P., Benedicto, M. D., Villapalos-García, G., Navares-Gómez, M., Mejía-Abril, G., Román, M., Martín-Vílchez, S., Ochoa, D., & Abad-Santos, F. (2021). *SLCO1B1* Phenotype and *CYP3A5* Polymorphism Significantly Affect Atorvastatin Bioavailability. *Journal of personalized medicine*, *11*(3), 204. https://doi.org/10.3390/jpm11030204	yes	qPCR	156		Caucasians, Latin-Americans	Atorvastatin	15 genes including *SLCO1B1* rs4149056 and *CYP3A5**3 rs776746	Higher exposure to atorvastatin	*SLCO1B1* rs4149056 and *CYP3A5**3 rs776746 were associated with increased atorvastatin exposure, providing a pharmacokinetic rationale for statin-induced myopathy risk.
Association between variants of COQ2 and TNF-α genes and statin-induced toxicities in Bangladeshi hyperlipidemic patients	NR	PCR-RFLP	57+94		Bangladeshi	Several statins	COQ2 (rs4693075) and TNF-α (rs1799724)	Myopathy	COQ2 gene polymorphism (rs4693075, G > C), but not TNF-α gene polymorphism (rs1799724, C > T), is involved in causing statin-induced myopathy in Bangladeshi hyperlipidemic patients
Dirjal, A. H., Hussain, D. A. A., & Sahib, A. S. (2019). THE FREQUENCY OF THE *SLCO1B1* GENE SNP521T< C AND MYOPATHY IN A SAMPLE OF ARAB IRAQI PATIENTS. *Biochemical & Cellular Archives*, *19*(1).	yes	qPCR	48+48		Arabian	NR	*SLCO1B1* rs4149056	Myopathy (determined by a history of the patient)	*SLCO1B1* rs4149056 C-allele carriers (TC/CC), were significantly overrepresented among patients with statin-induced myopathy.
Khine, H., Yuet, W. C., Adams-Huet, B., & Ahmad, Z. (2016). Statin-associated muscle symptoms and *SLCO1B1* rs4149056 genotype in patients with familial	NR	PCR, sequencing and MLPA	278		African-American, Non-Hispanic	Pravastatin Simvastatin Atorvastatin Rosuvastatin	*SLCO1B1* rs4149056	SAMS	*SLCO1B1* genotype was not associated with the risk of statin-associated muscle symptoms

hypercholesterolemia. *American heart journal*, *179*, 1–9. https://doi.org/10.1016/j.ahj.2016.05.015					white and Hispanic				
Luzum, J. A., Kitzmiller, J. P., Isackson, P. J., Ma, C., Medina, M. W., Dauki, A. M., Mikulik, E. B., Ochs-Balcom, H. M., & Vladutiu, G. D. (2015). GATM polymorphism associated with the risk for statin-induced myopathy does not replicate in case-control analysis of 715 dyslipidemic individuals. *Cell metabolism*, *21*(4), 622–627. https://doi.org/10.1016/j.cmet.2015.03.003	yes	PCR	609+106		Caucasian	Atorvastatin Simvastatin Rosuvastatin Pravastatin Lovastatin	GATM rs9806699	Myopathy	Although an initial association between GATM rs9806699 and statin-induced myopathy had been reported, this large multicentre case–control replication study failed to confirm such association.
Carr, D. F., O'Meara, H., Jorgensen, A. L., Campbell, J., Hobbs, M., McCann, G., van Staa, T., & Pirmohamed, M. (2013). *SLCO1B1* genetic variant associated with statin-induced myopathy: a proof-of-concept study using the clinical practice research datalink. *Clinical pharmacology and therapeutics*, *94*(6), 695–701. https://doi.org/10.1038/clpt.2013.161	yes	qPCR	76+372		UK	Atorvastatin Simvastatin Rosuvastatin Fluvastatin Pravastatin	*SLCO1B1* rs4149056 COQ2 rs4693075	Myopathy	Carriers of *SLCO1B1* c.521C allele had increased risk of statin-induced myopathy; COQ2 rs4693075 showed no association
Poduri, A., Khullar, M., Bahl, A., Sehrawat, B. S., Sharma, Y., & Talwar, K. K. (2010). Common variants of HMGCR, CETP, APOAI, *ABCB1*, *CYP3A4*, and CYP7A1 genes as predictors of lipid-lowering response to atorvastatin therapy. *DNA and cell biology*, *29*(10), 629–637. https://doi.org/10.1089/dna.2009.1008	yes	PCR	265		India	Atorvastatin	HMGCR, CETP, APOAI, *ABCB1*, *CYP3A4*, CYP7A1	Reduced LDL-C lowering response	*ABCB1* (-41A/G), HMGCR (SNP29, rs5908, rs12916), and CYP7A1 (-204A/C) variants were associated with reduced LDL-C lowering

Gao, Y., Zhang, L. R., & Fu, Q. (2008). *CYP3A4**1G polymorphism is associated with lipid-lowering efficacy of atorvastatin but not of simvastatin. *European journal of clinical pharmacology*, *64*(9), 877–882. https://doi.org/10.1007/s00228-008-0502-x	yes	PCR-RFLP	416		Chinese	Atorvastatin Simvastatin	*CYP3A4**1G	Reduced lipid-lowering response	Carrying *CYP3A4**1G increase the lipid-lowering efficacy of atorvastatin and may have no significant effect on simvastatin treatment.
Zhang, W., Chen, B. L., Ozdemir, V., He, Y. J., Zhou, G., Peng, D. D., Deng, S., Xie, Q. Y., Xie, W., Xu, L. Y., Wang, L. C., Fan, L., Wang, A., & Zhou, H. H. (2007). *SLCO1B1* 521T-->C functional genetic polymorphism and lipid-lowering efficacy of multiple-dose pravastatin in Chinese coronary heart disease patients. *British journal of clinical pharmacology*, *64*(3), 346–352. https://doi.org/10.1111/j.1365-2125.2007.02892.x	yes	ARMS-PCR	45		Chinese	Pravastatin	*SLCO1B1* rs4149056	Reduced lipid-lowering response	*SLCO1B1* rs4149056 appears to modulate significantly the total cholesterol-lowering efficacy of pravastatin in Chinese patients

Footnotes. NR: not reported